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FIG. 1a

SUB-NANOPOROUS ZEOLITES : < 1nm

FAUJASITE

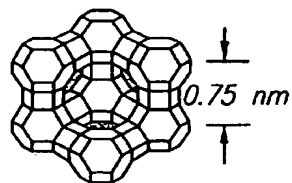
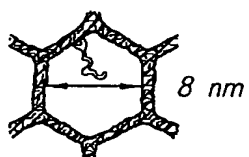


FIG. 1b

FIG. 1c

MESOPOROUS MOLECULAR SIEVES: 2- 10 nm

MCM-41



ULTRA LARGE PORE MATERIALS 5 - 50 nm

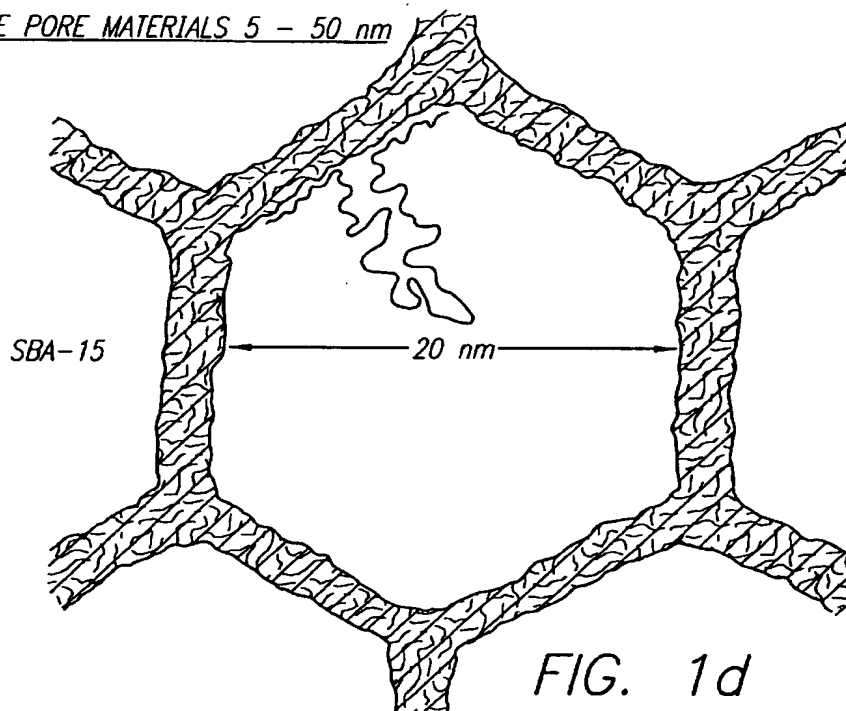


FIG. 1d

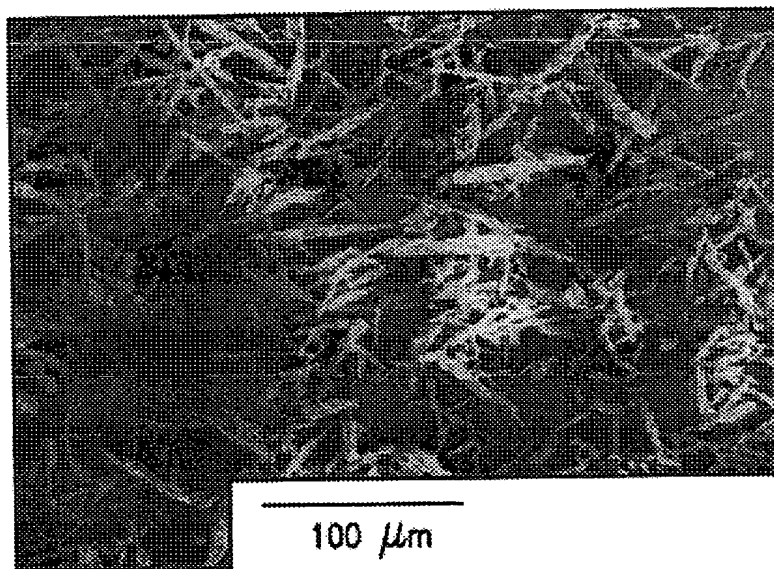


FIG. 3a

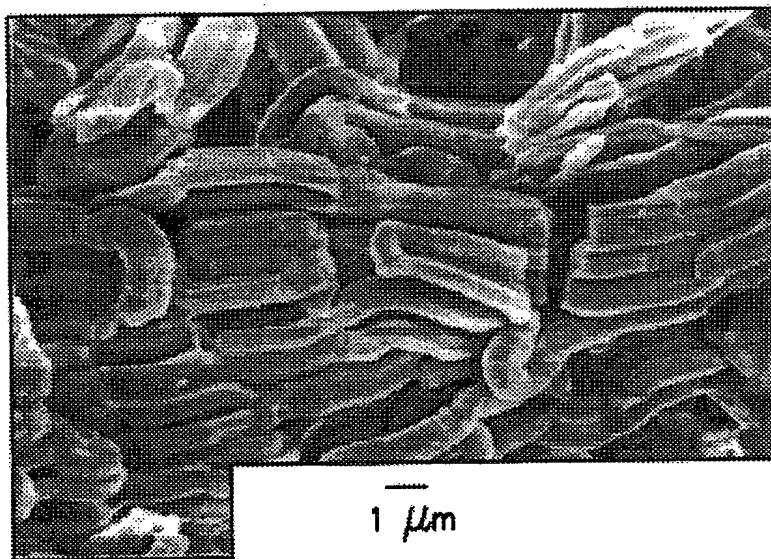


FIG. 3b

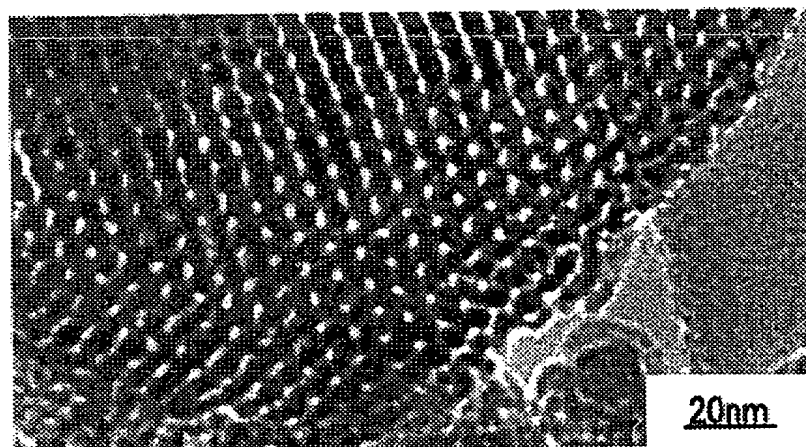


FIG. 3c



FIG. 3d

FIG. 4a

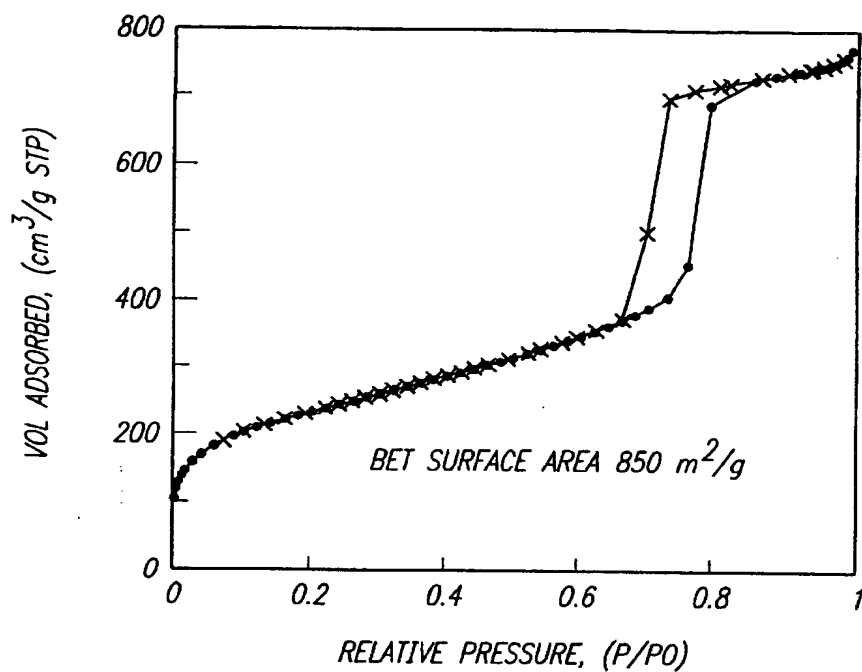


FIG. 4b

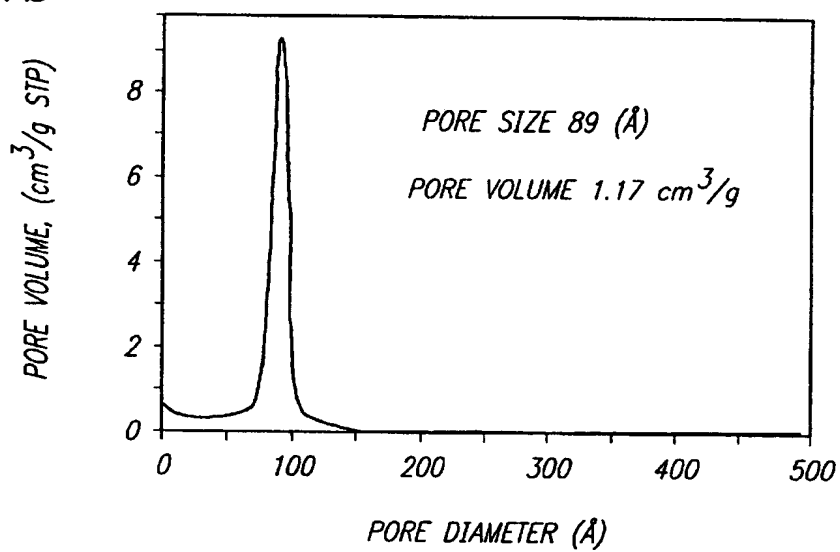


FIG. 4c

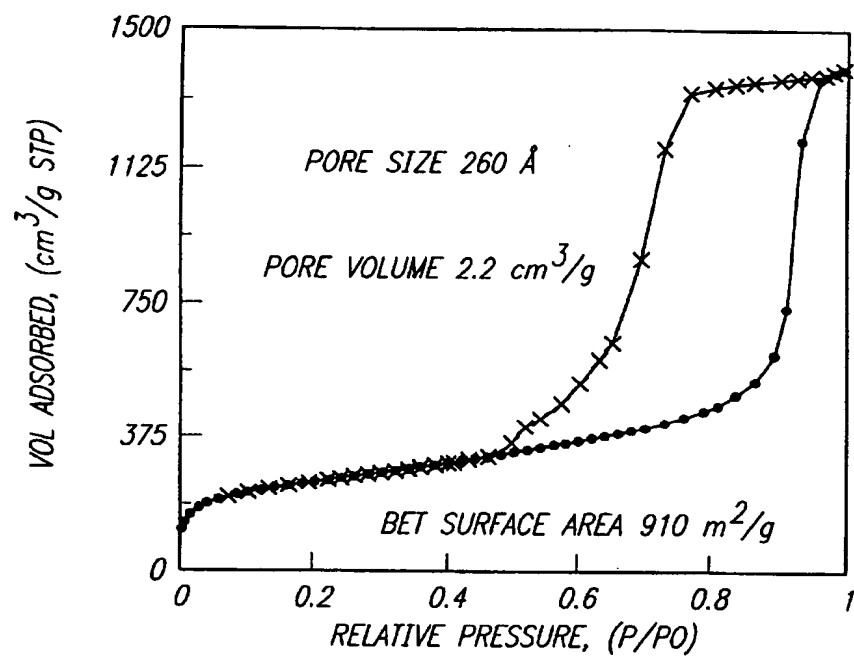


FIG. 4d

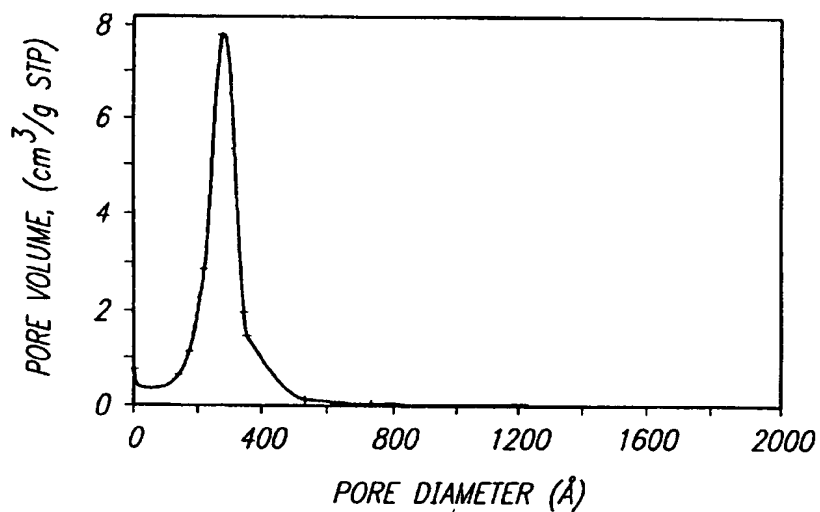


FIG. 5a

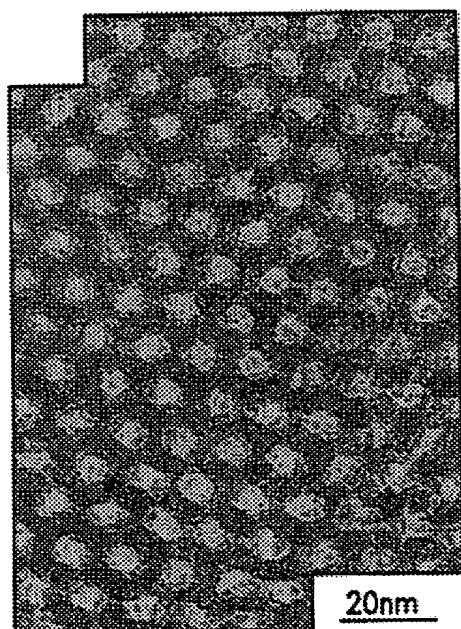


FIG. 5b

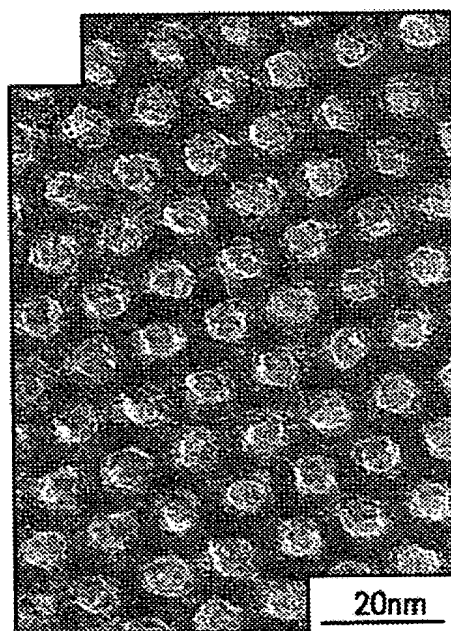


FIG. 5c

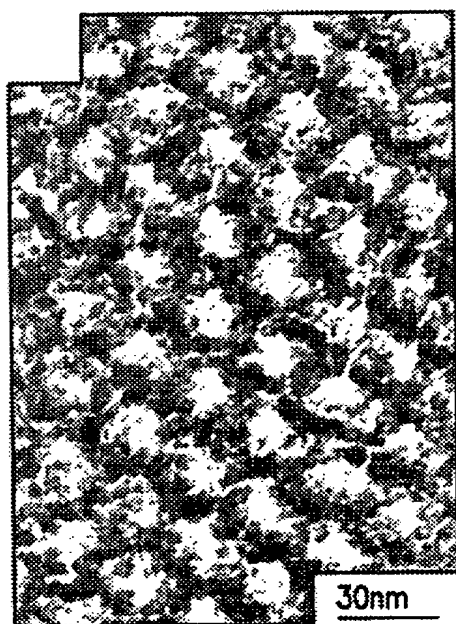
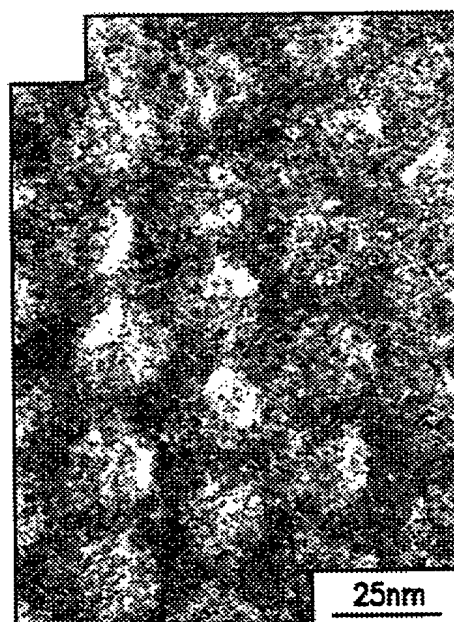


FIG. 5d



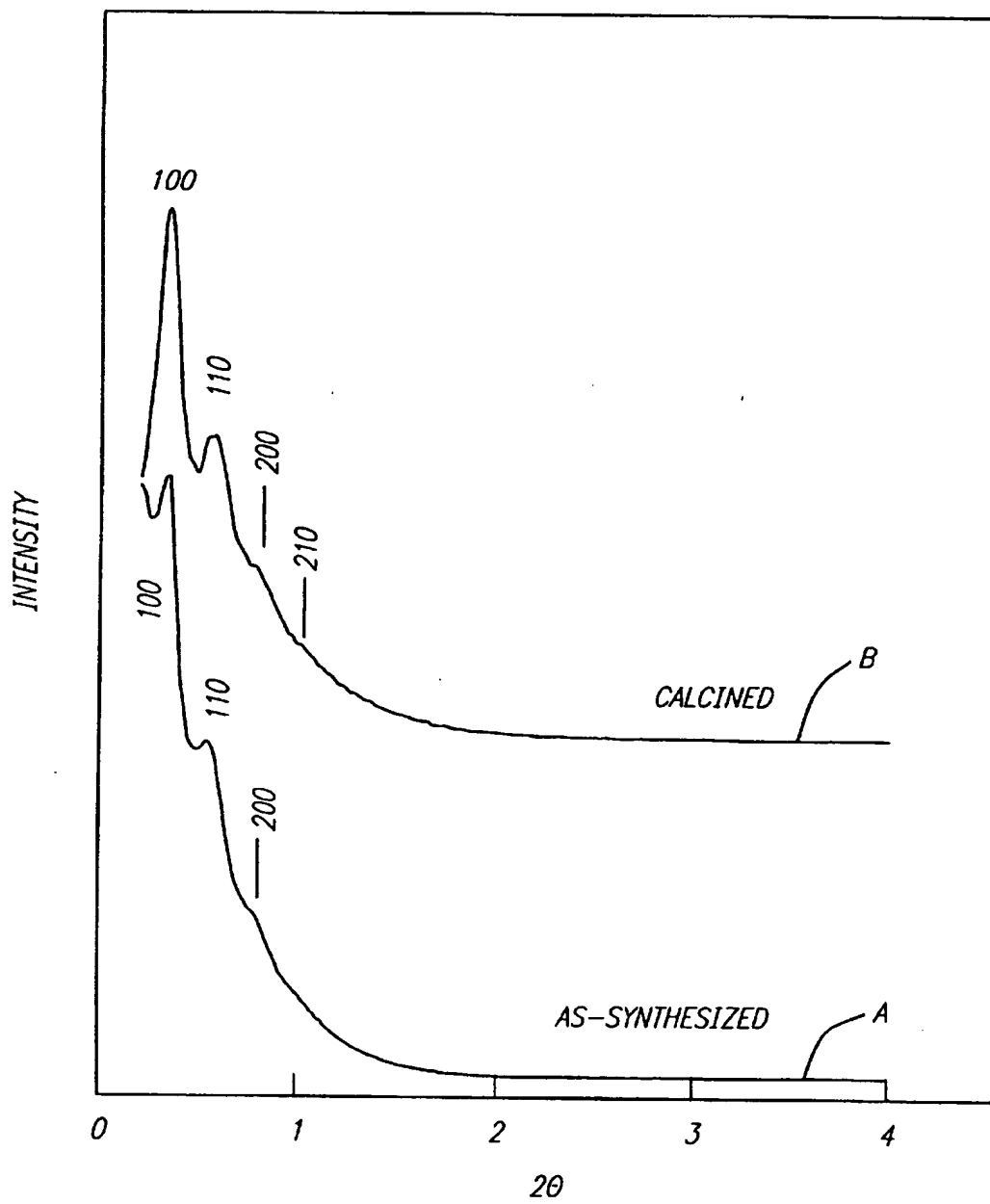
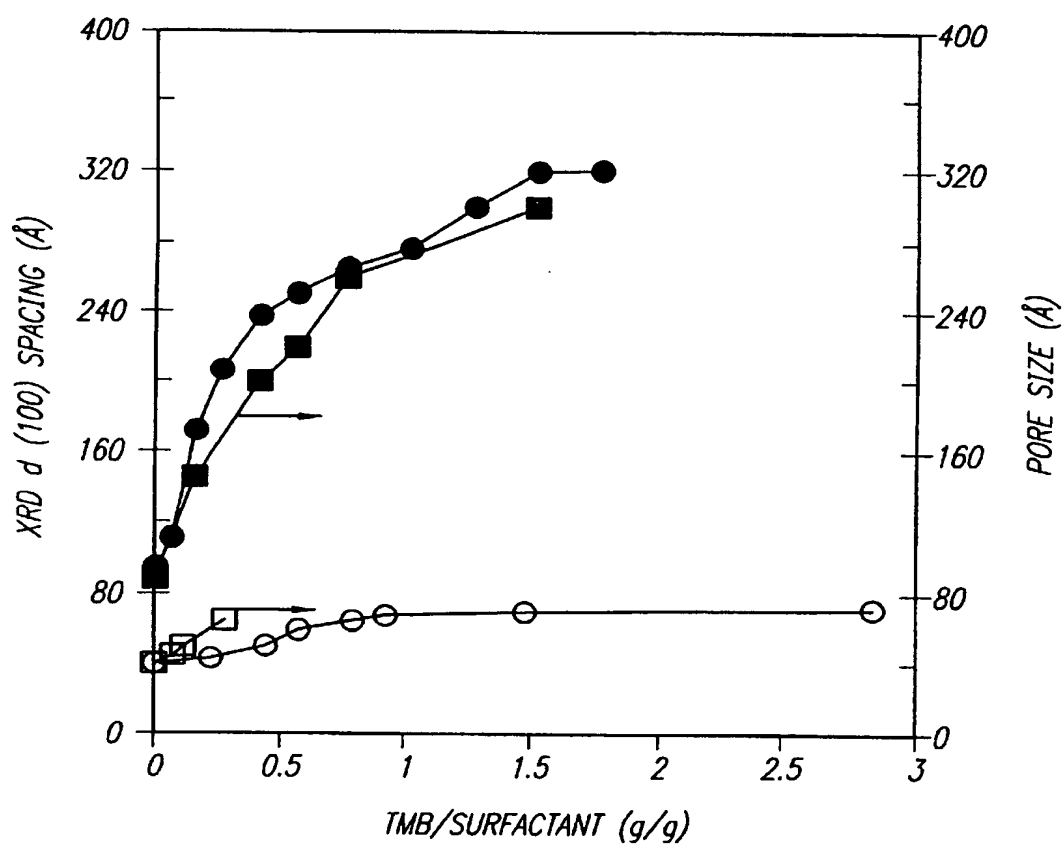


FIG. 6

FIG. 7



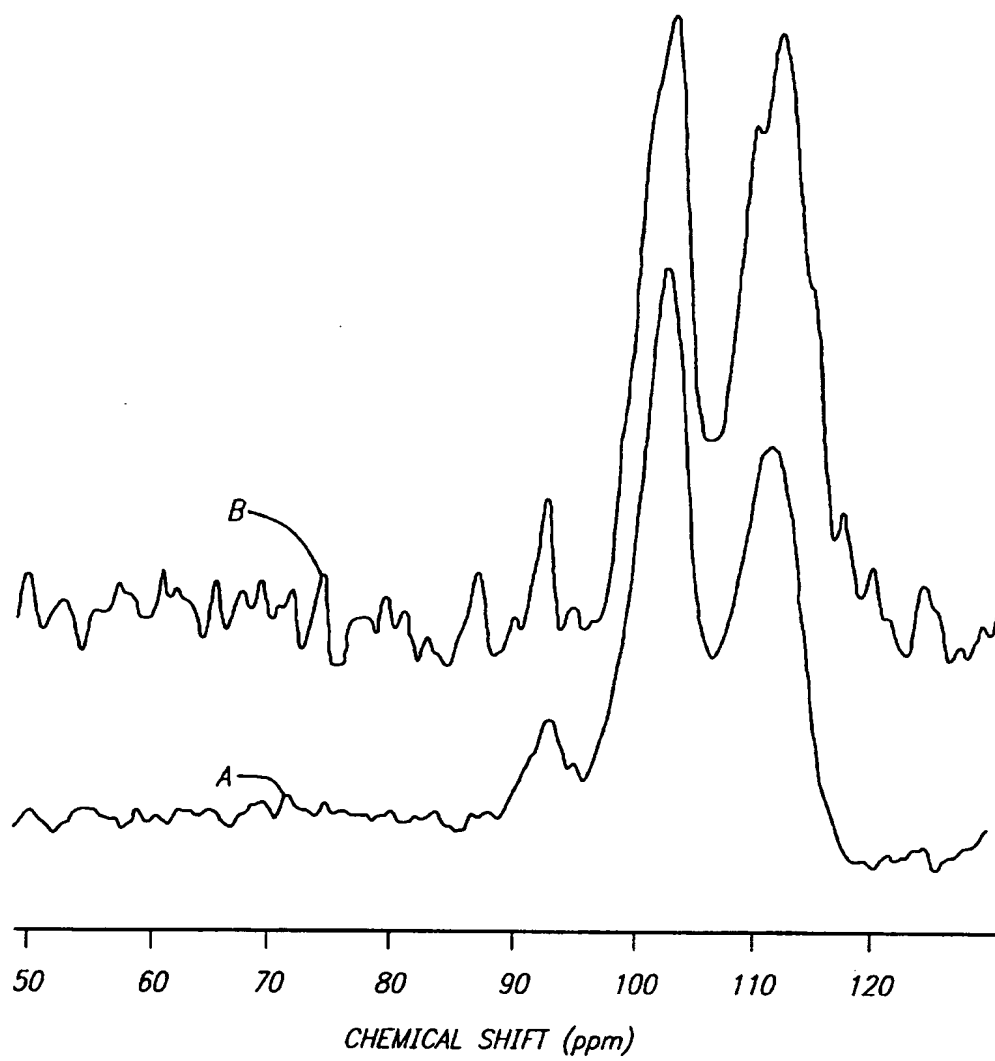


FIG. 8

FIG. 9

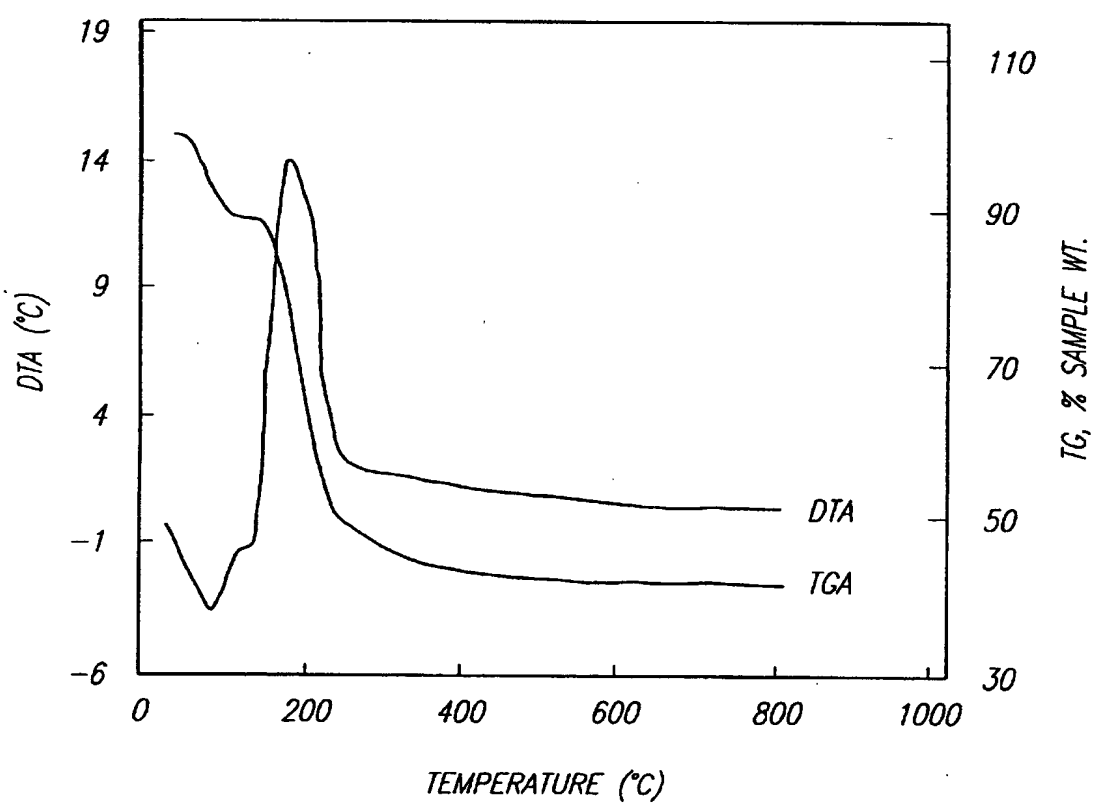


FIG. 10a

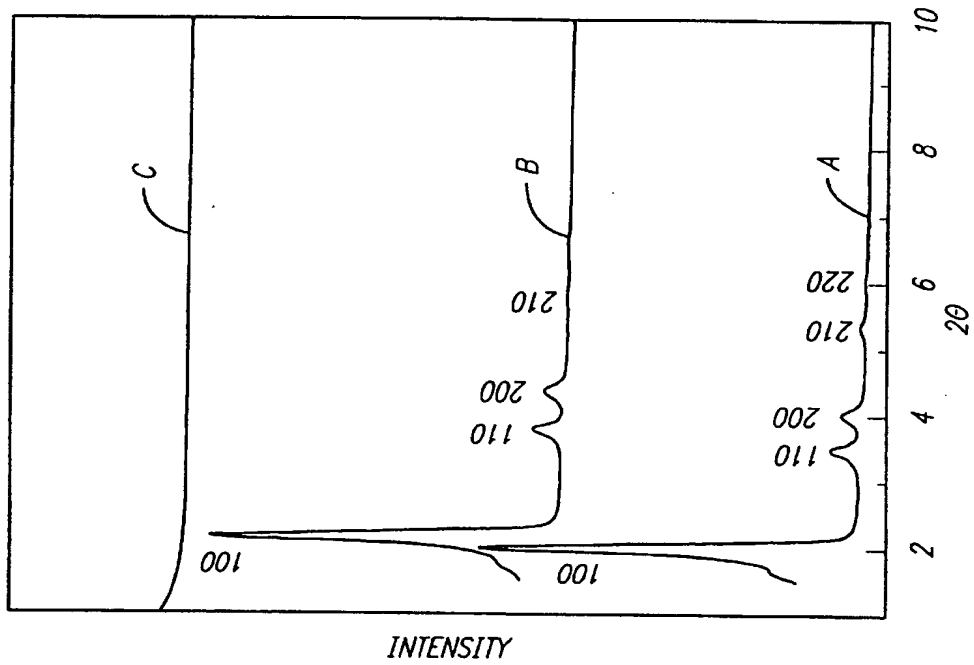


FIG. 10b

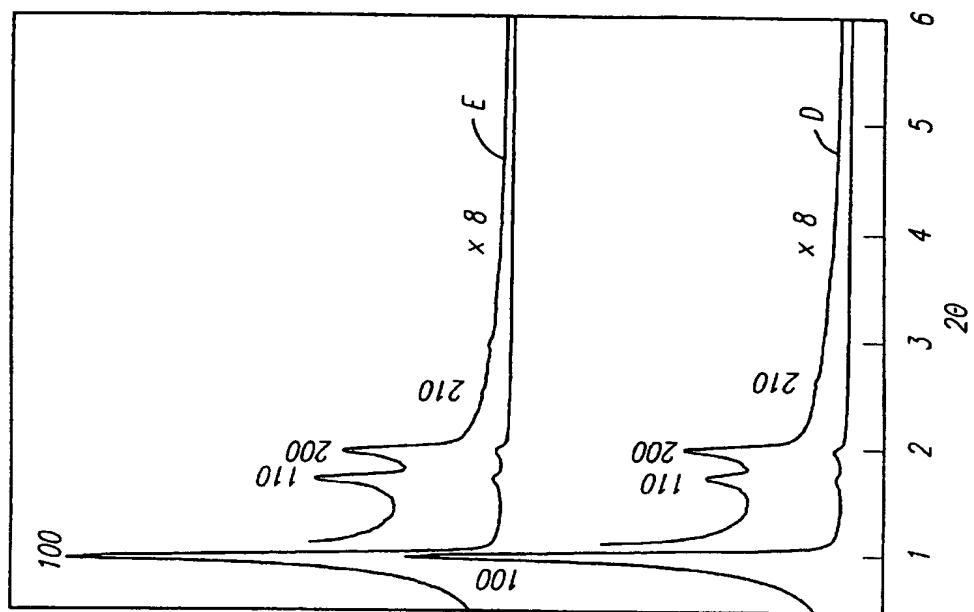


FIG. 11a

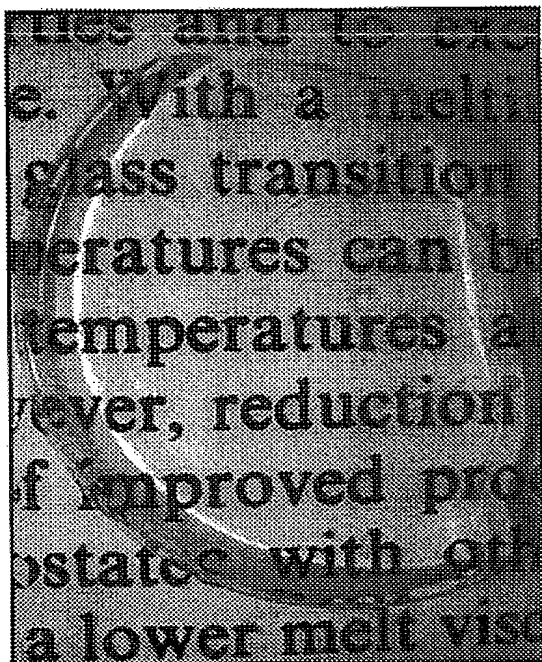
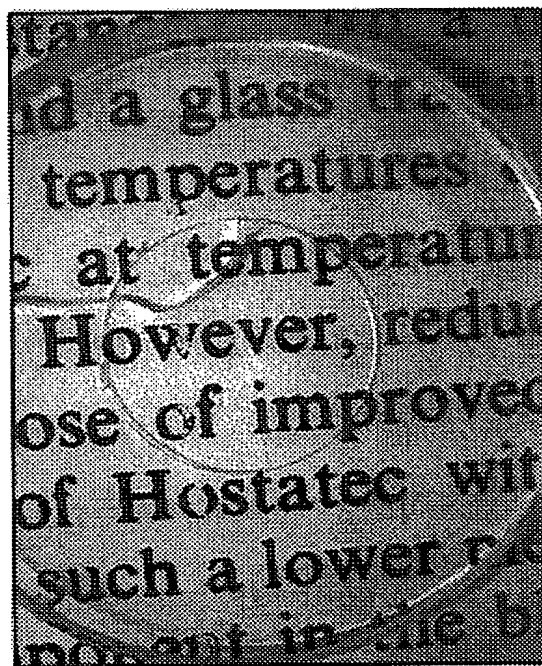


FIG. 11b



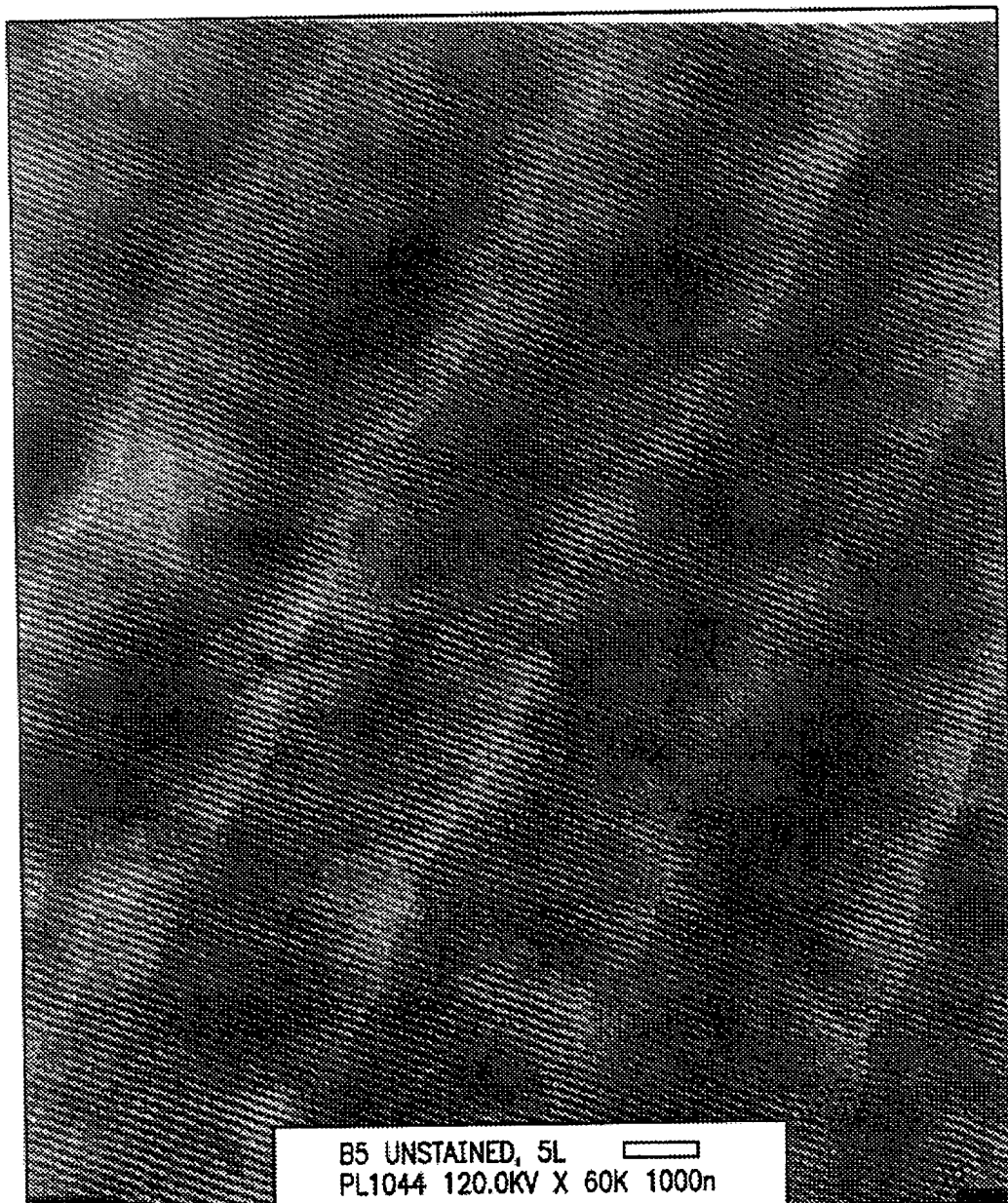


FIG. 12

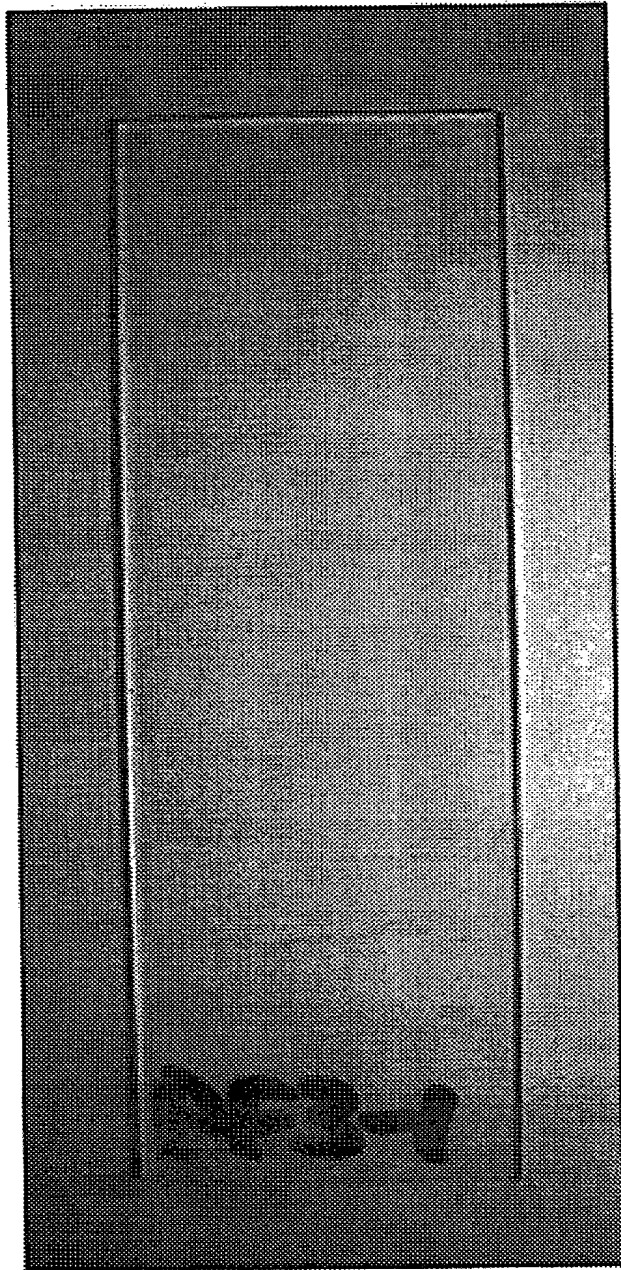


FIG. 13a

FIG. 13b

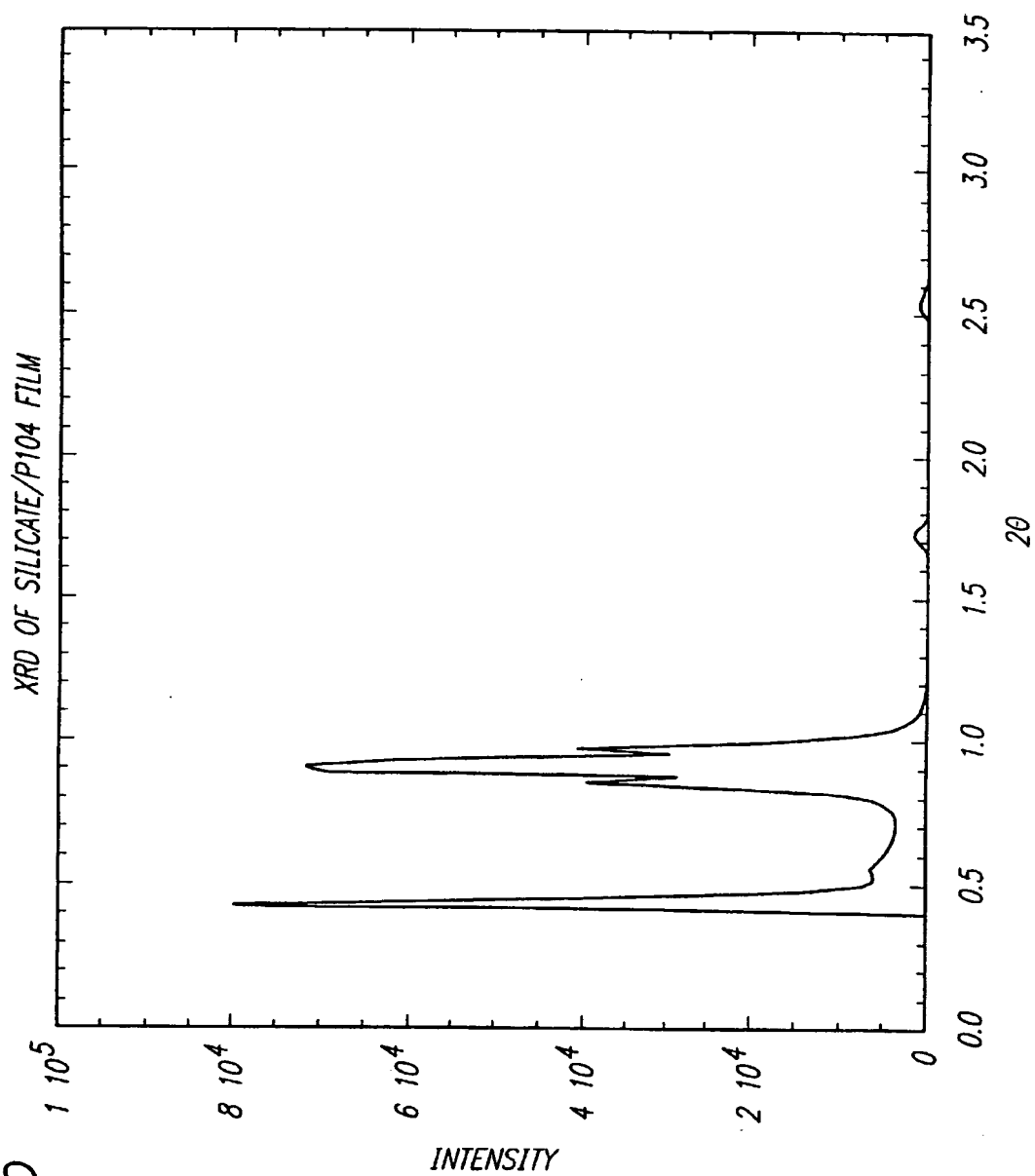


FIG. 14

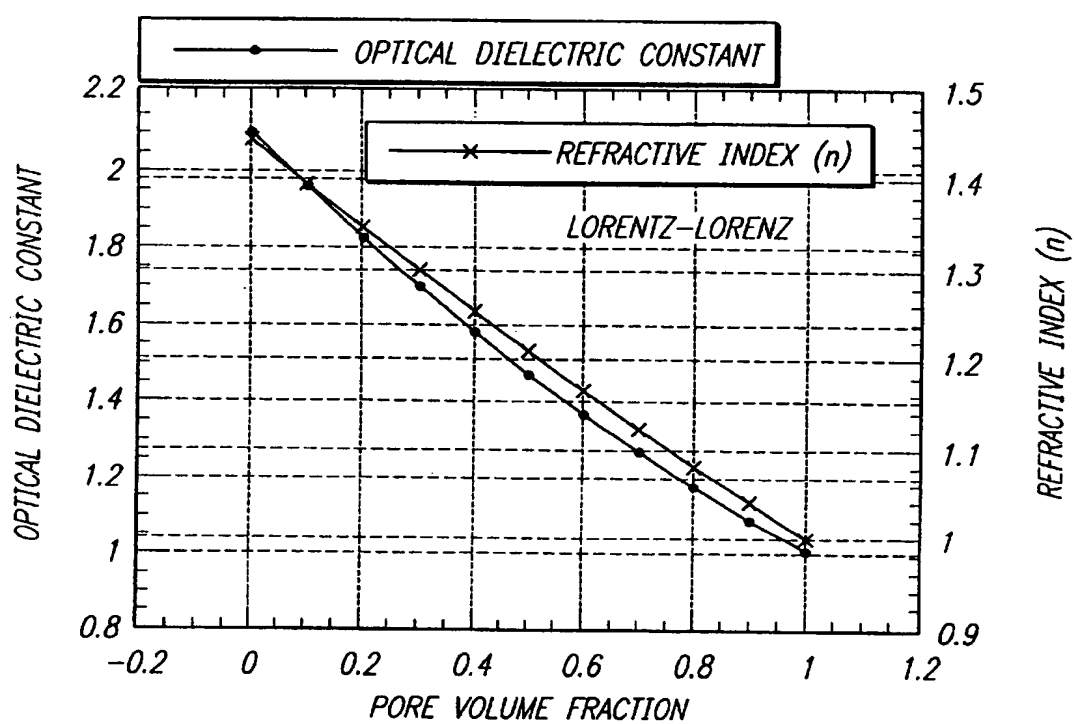
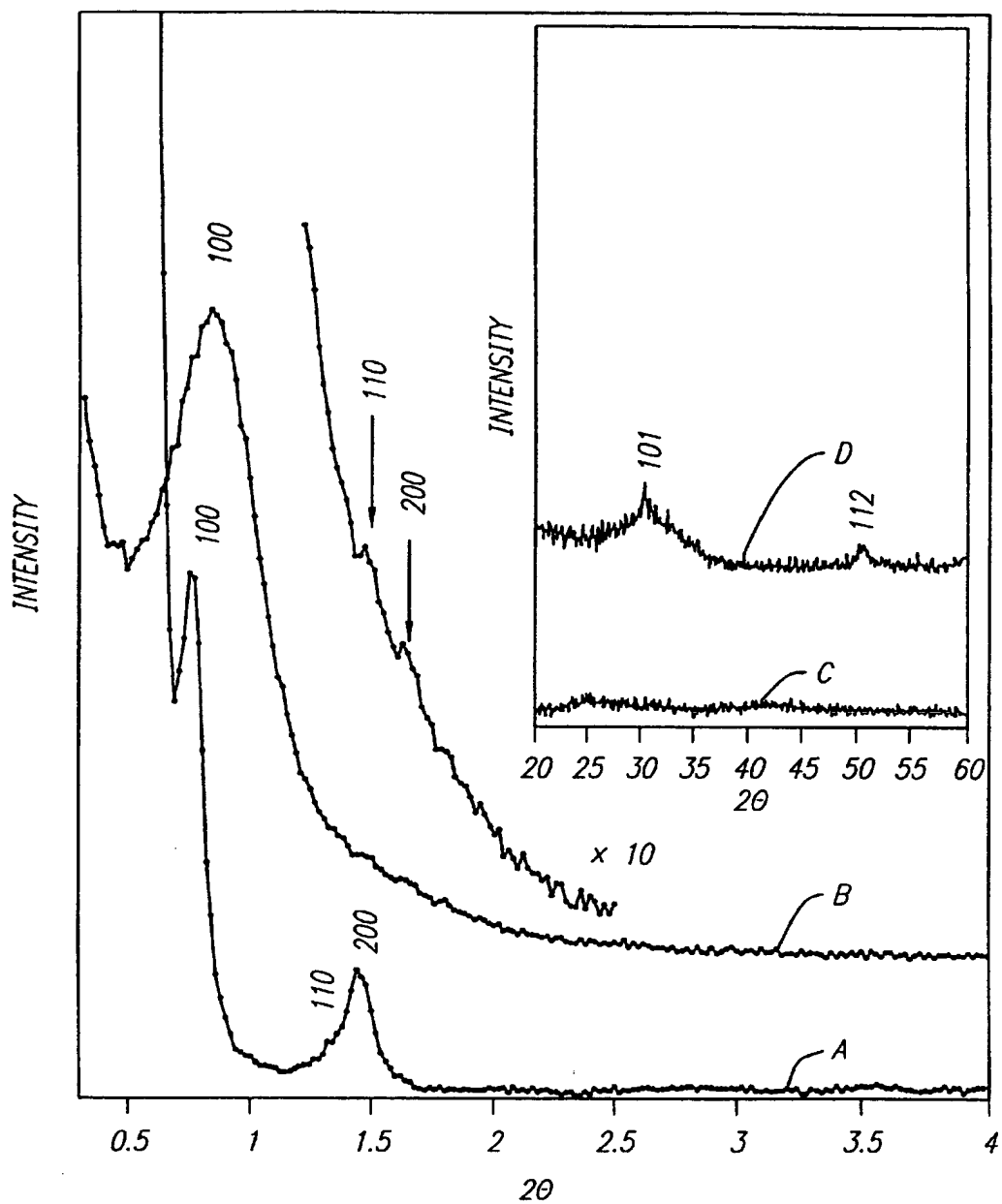


FIG. 15



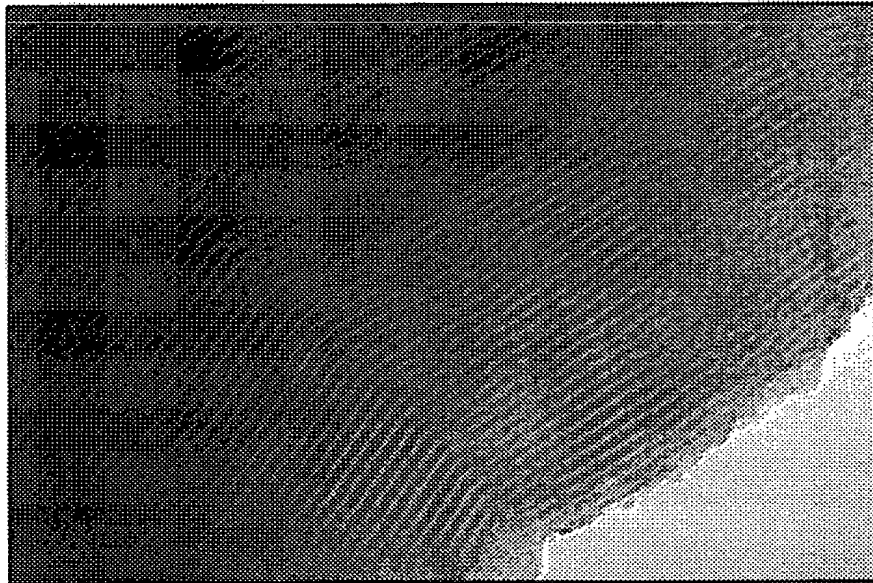


FIG. 16a

50 nm

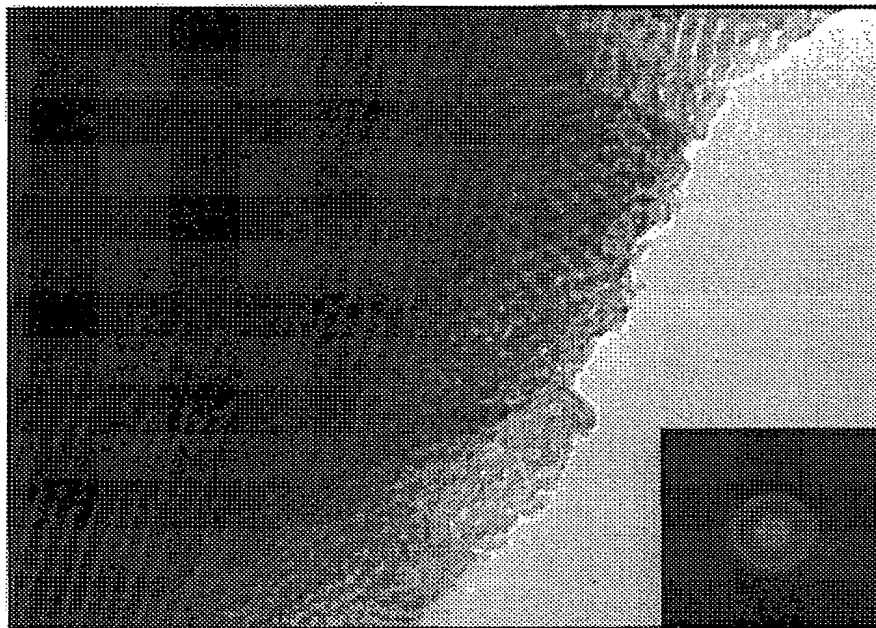


FIG. 16b

50 nm

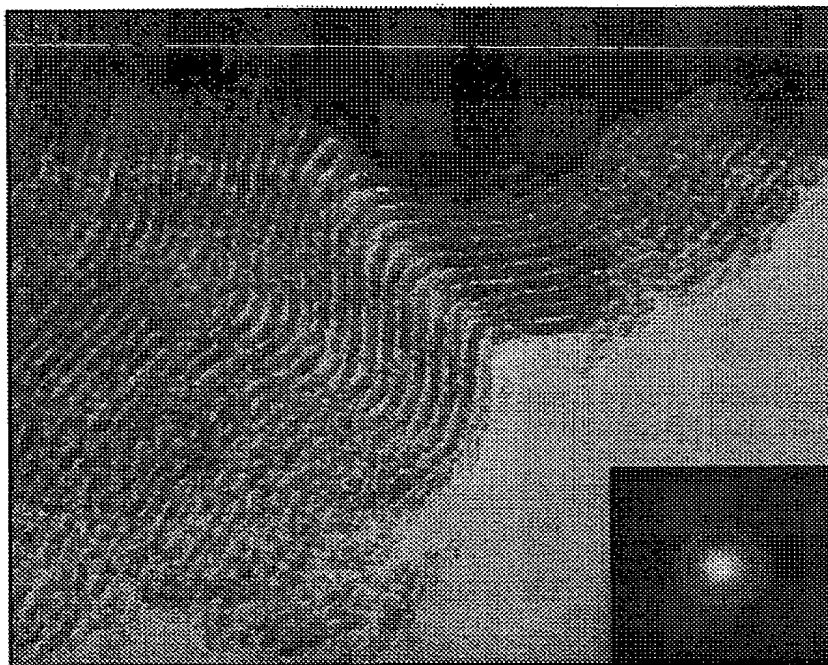



FIG. 17a

20 nm


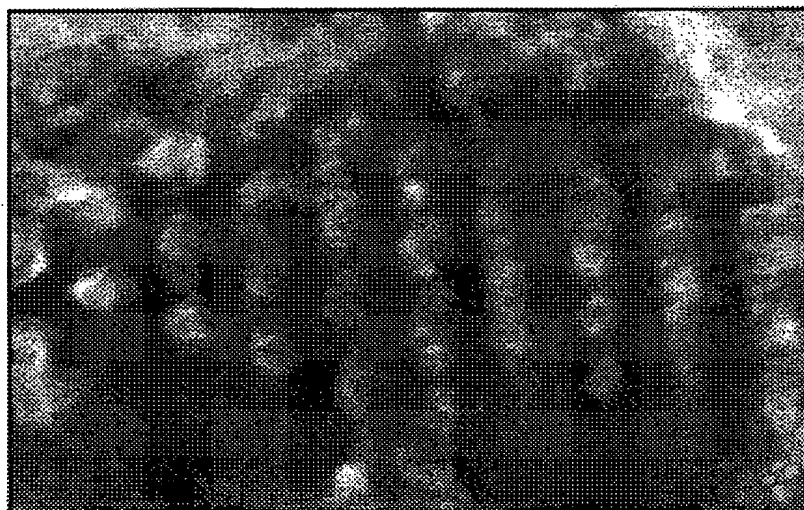


FIG. 17b


20 nm




FIG. 18a

100 nm

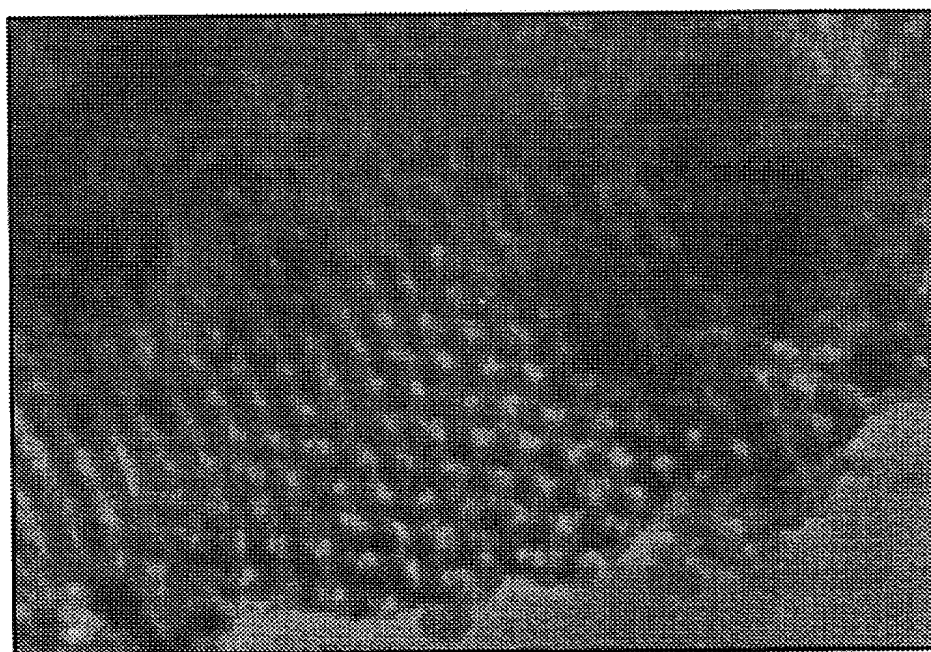


FIG. 18b

20 nm

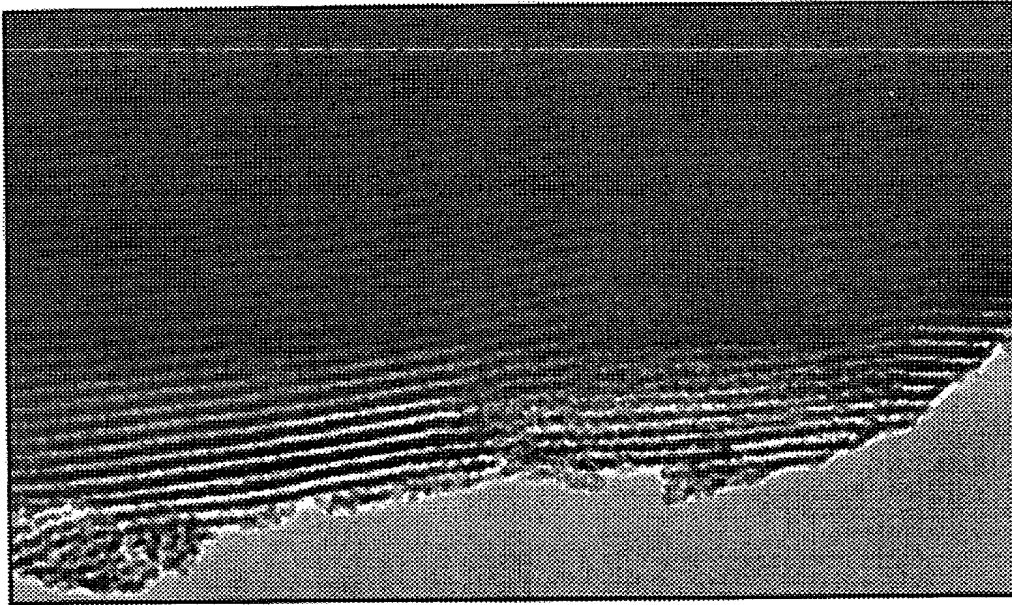


FIG. 19a

100 nm



FIG. 19b

50 nm

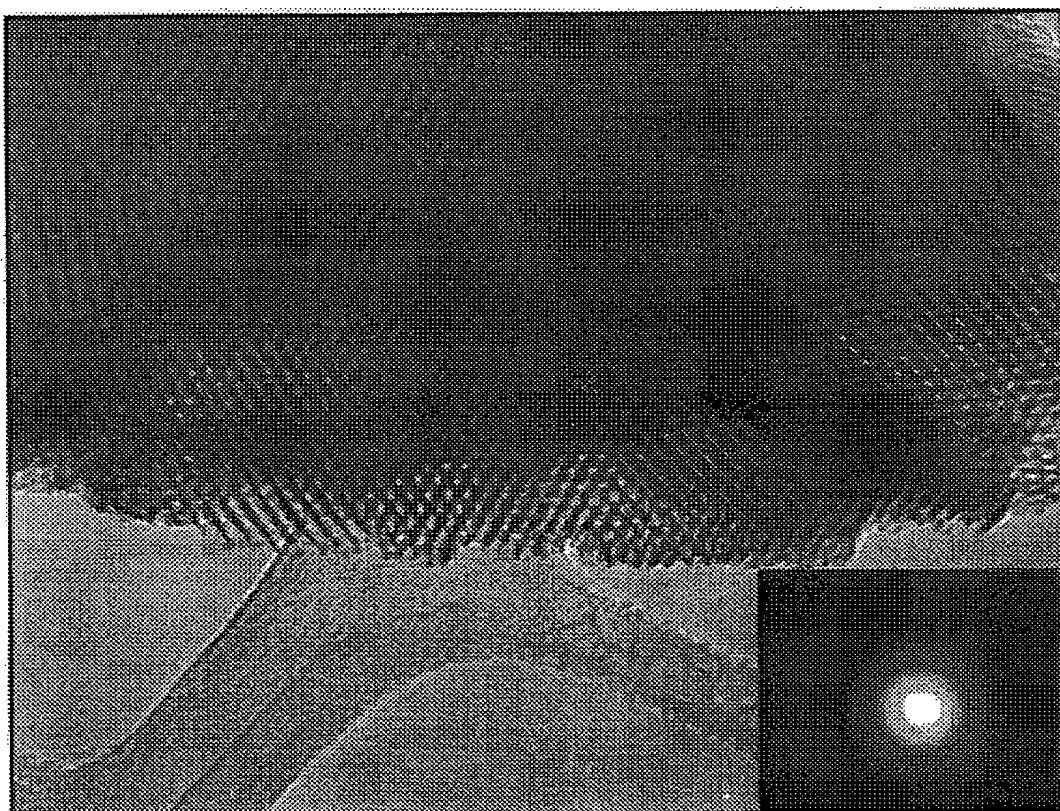



FIG. 20


20 nm

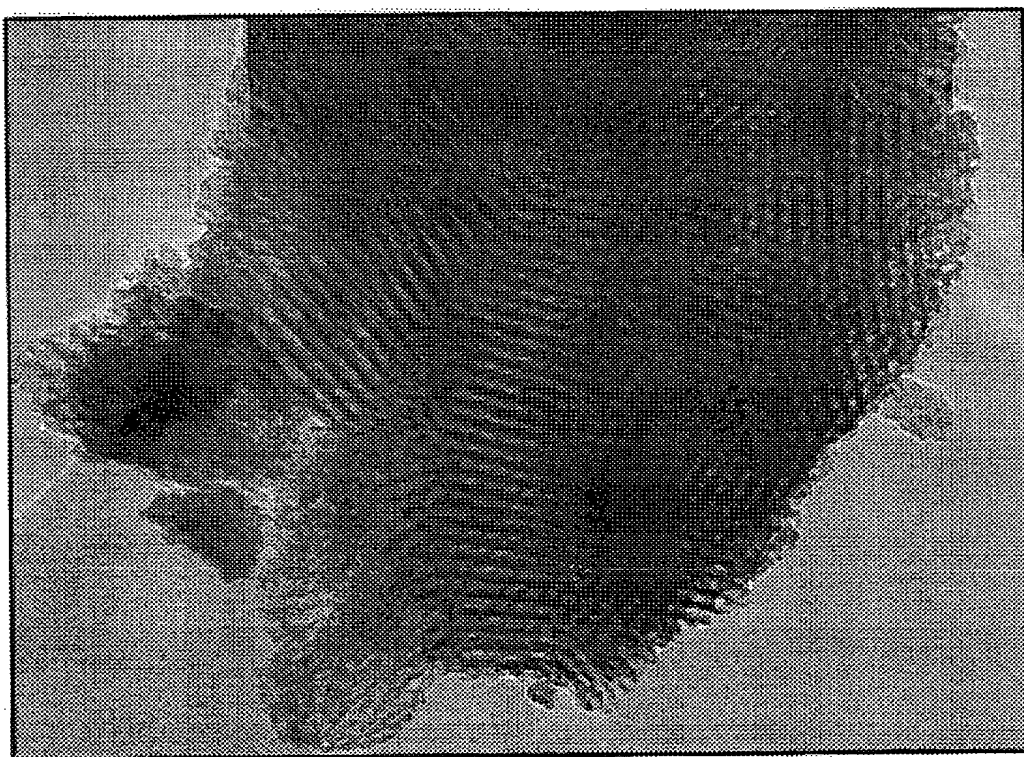



FIG. 21

50 nm


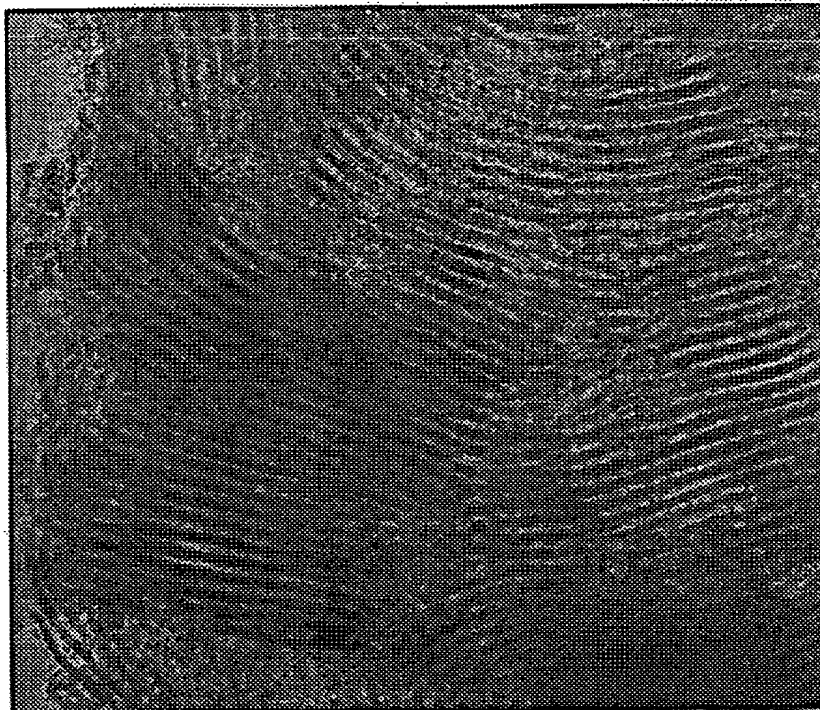


FIG. 22a

100 nm

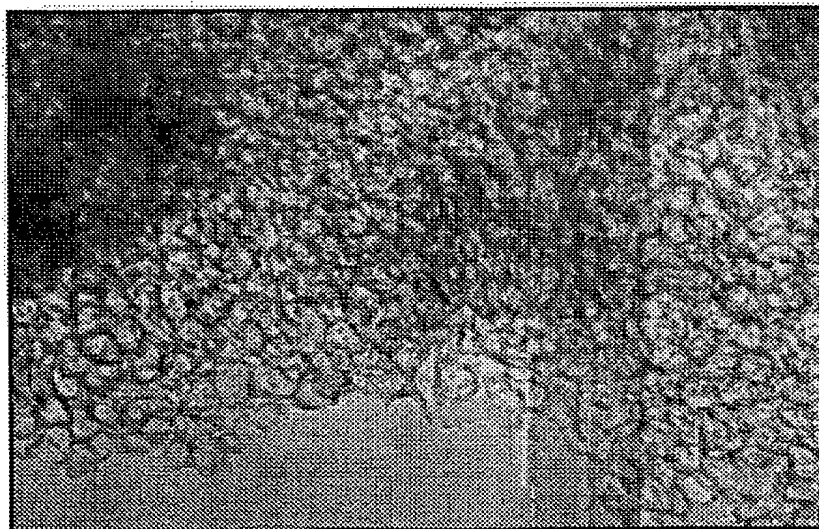
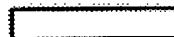


FIG. 22b

50 nm

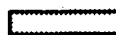





FIG. 23

50 nm


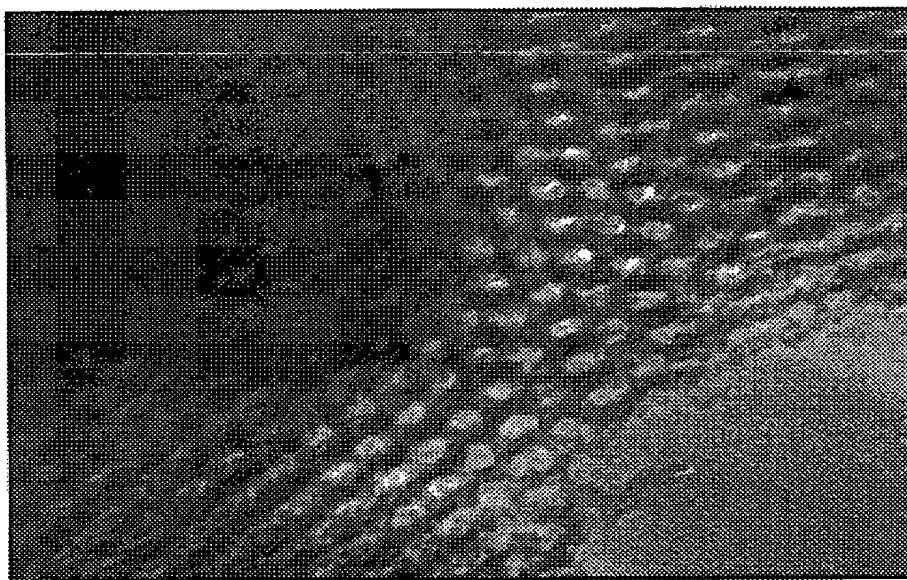


FIG. 24a

20 nm

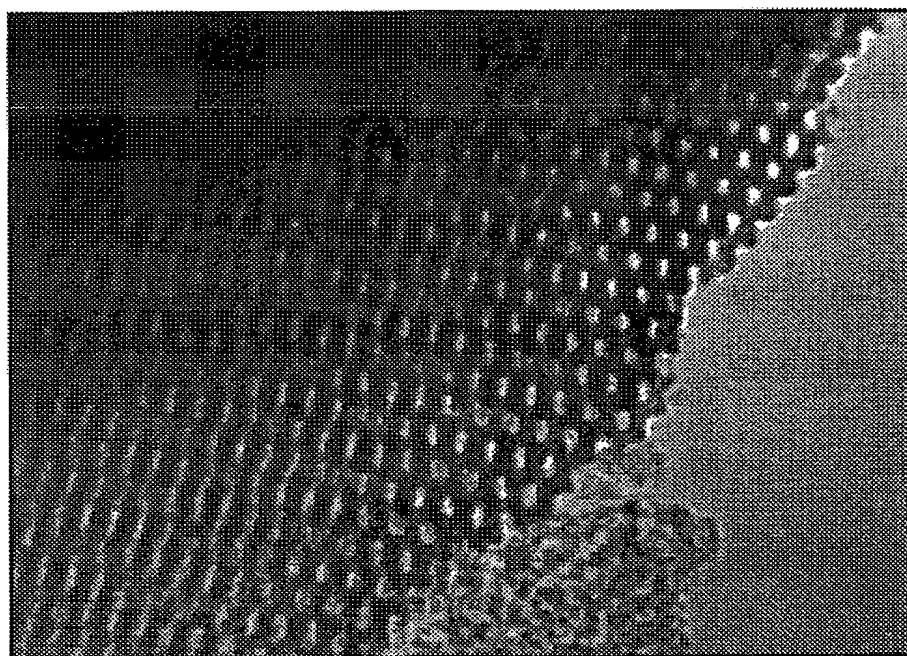


FIG. 24b

50 nm

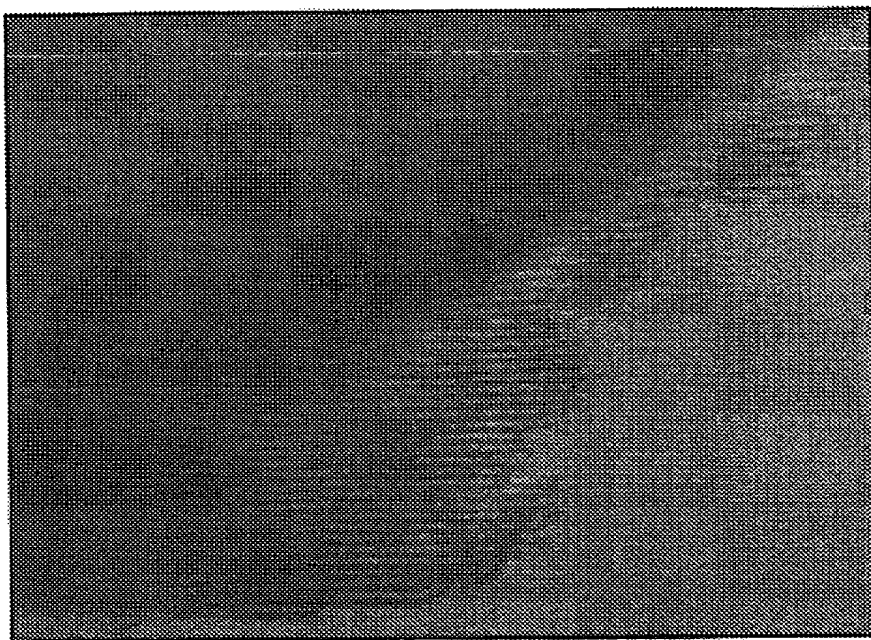


FIG. 25a

50 nm

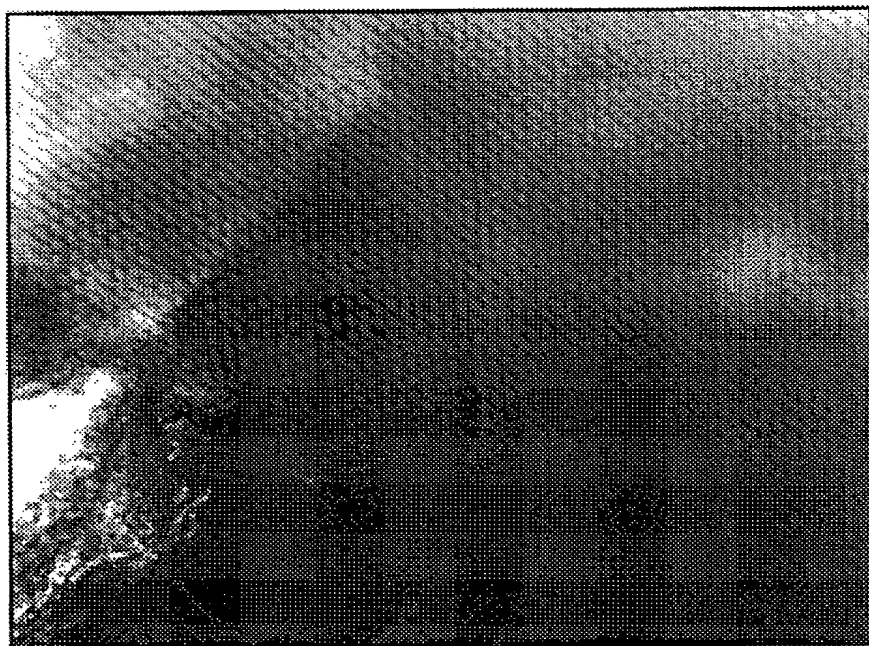


FIG. 25b

50 nm

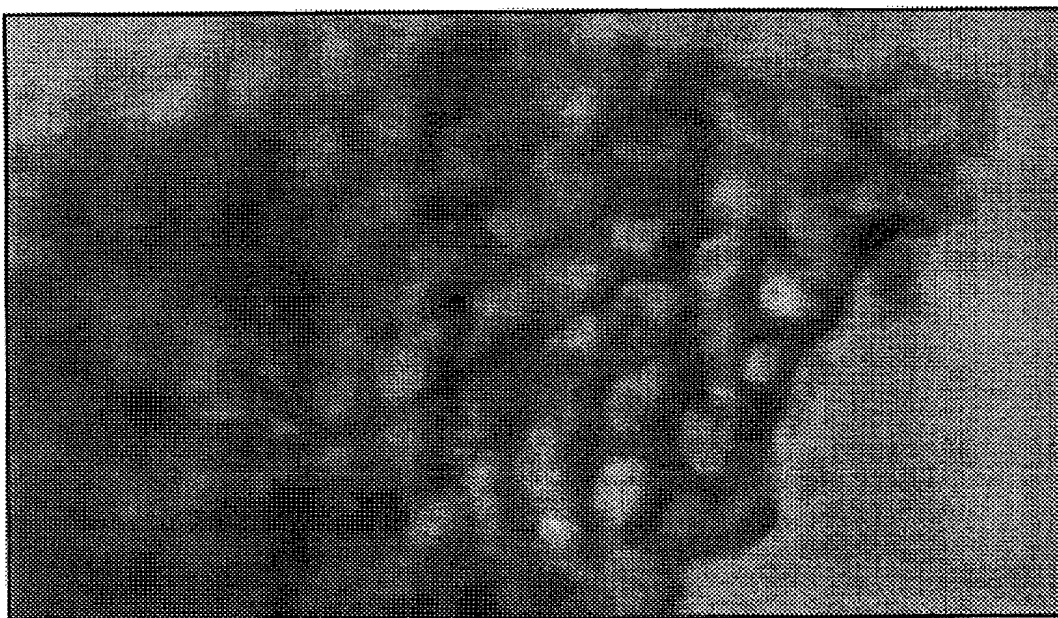
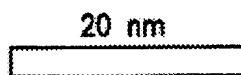


FIG. 26



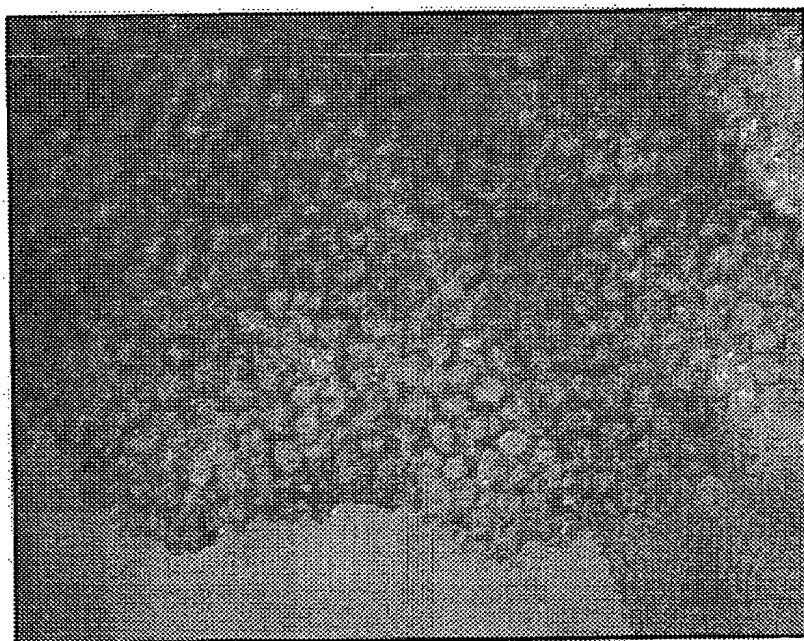


FIG. 27a 20 nm

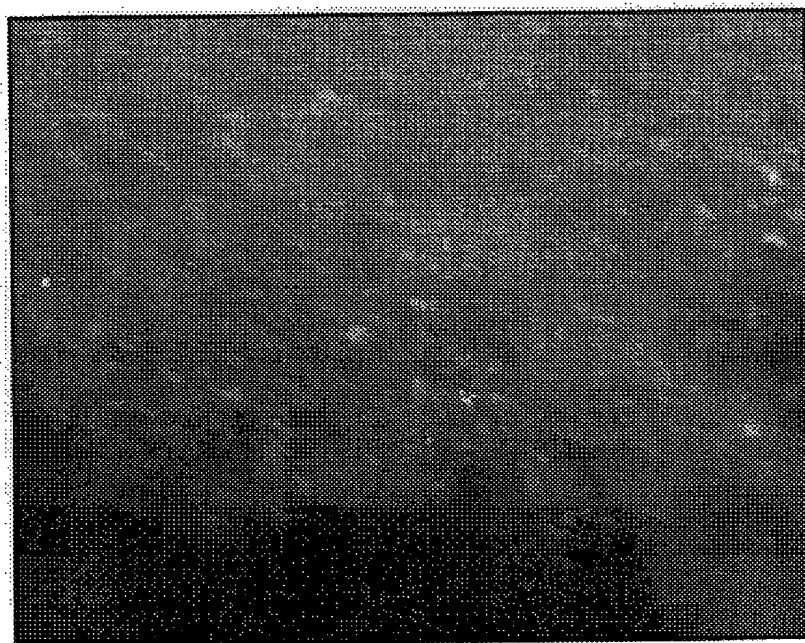


FIG. 27b 20 nm

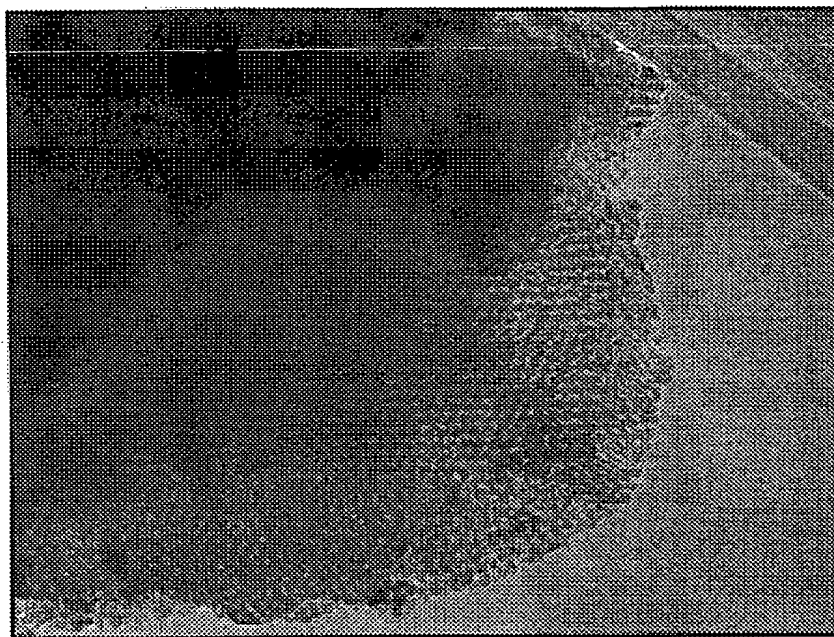


FIG. 28a

50 nm

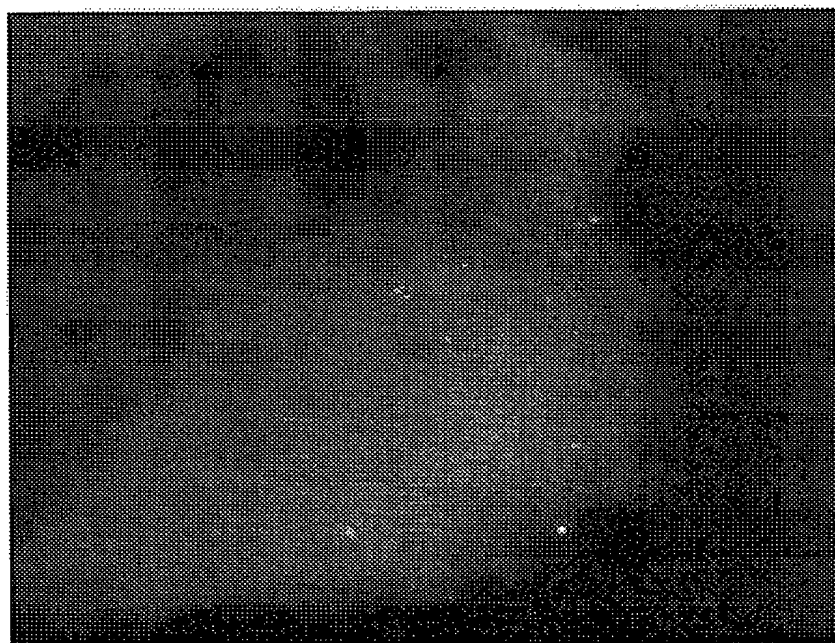


FIG. 28b

FIG. 29

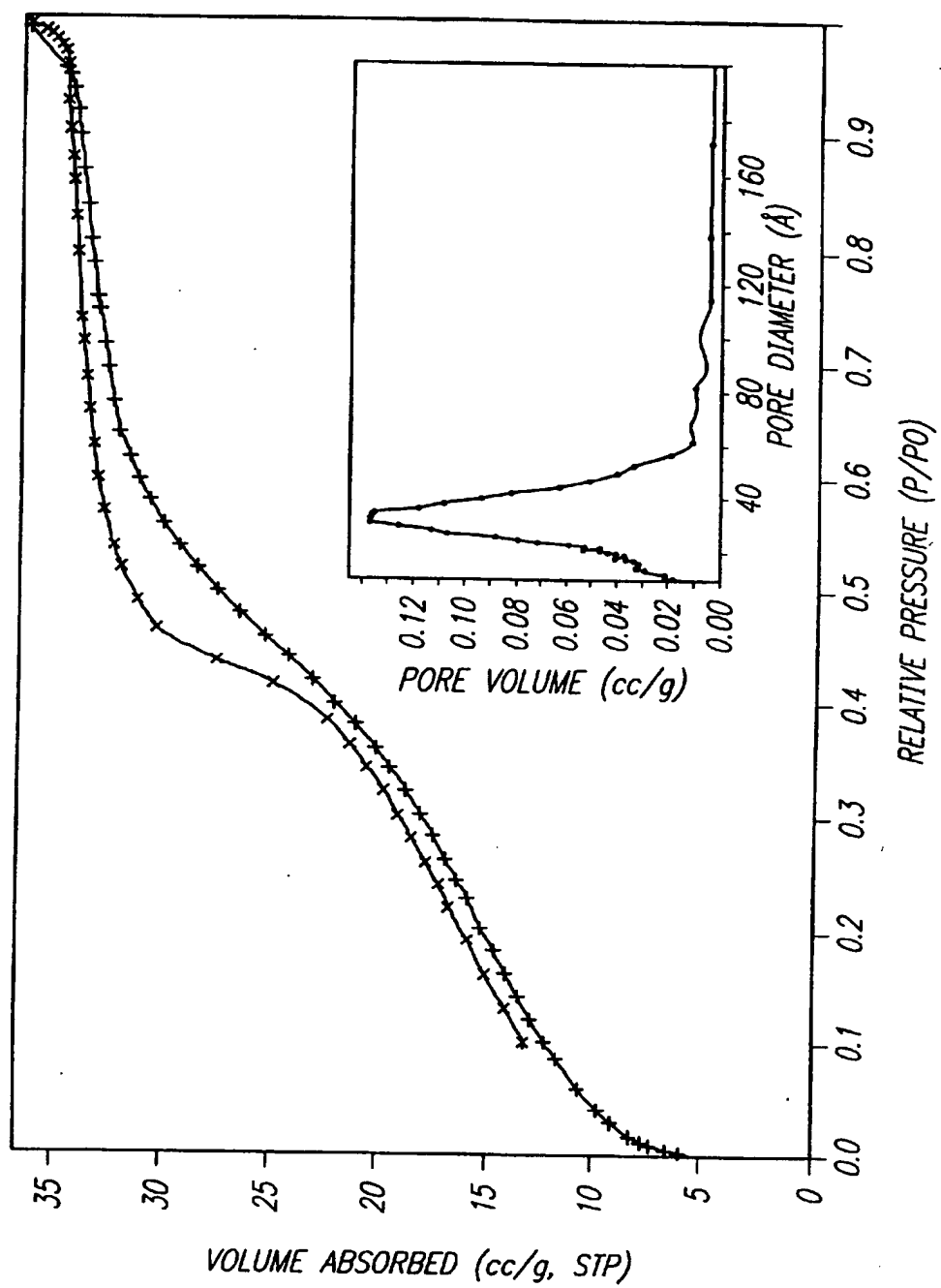


FIG. 30a

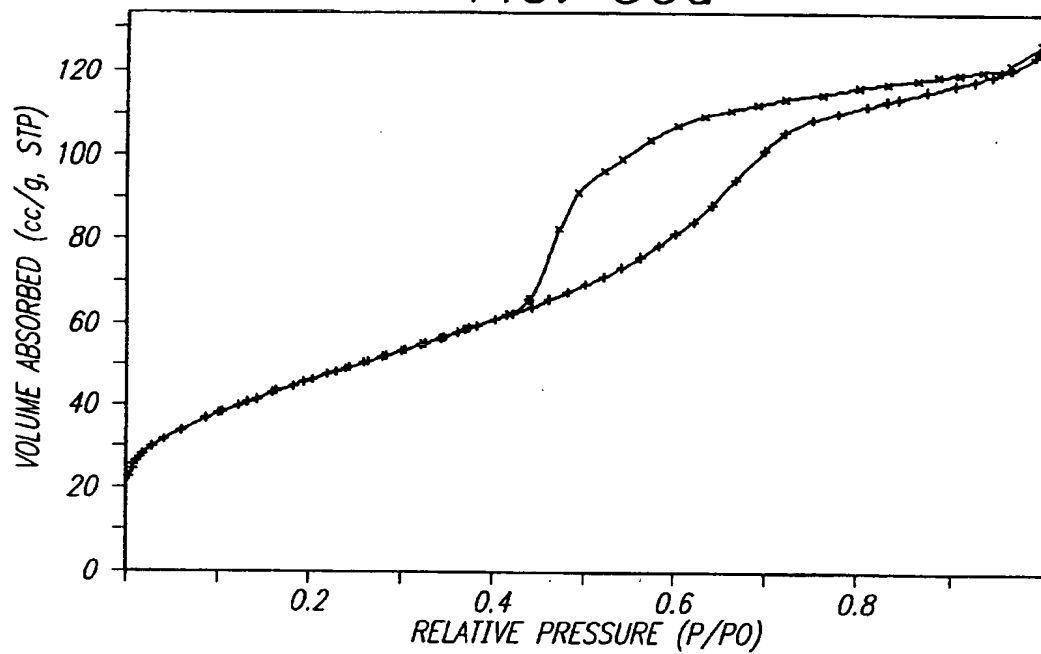


FIG. 30b

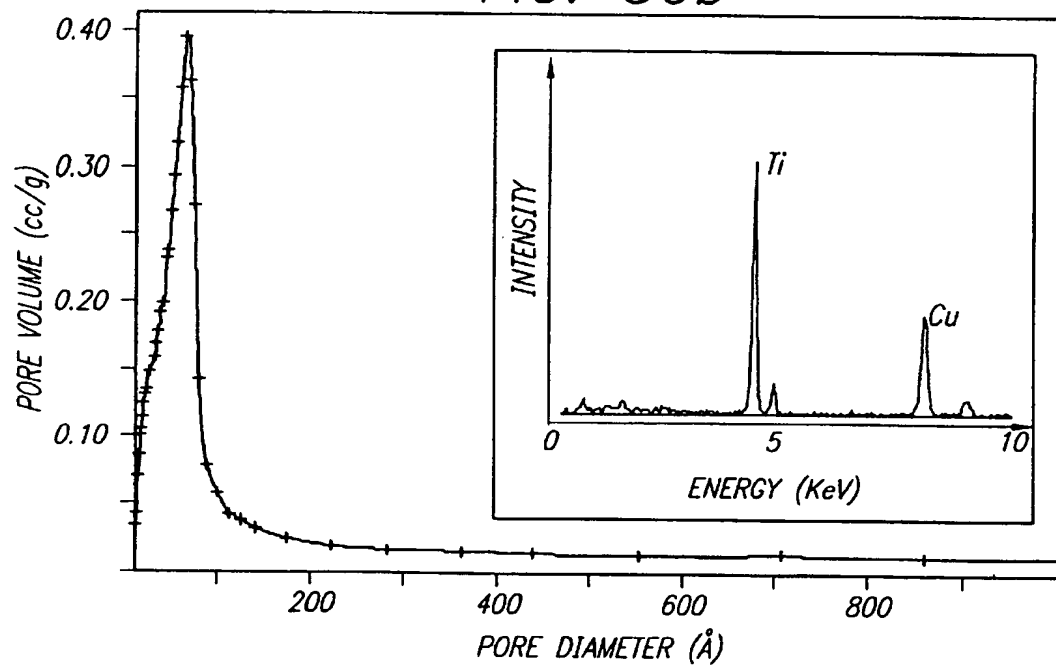


FIG. 31

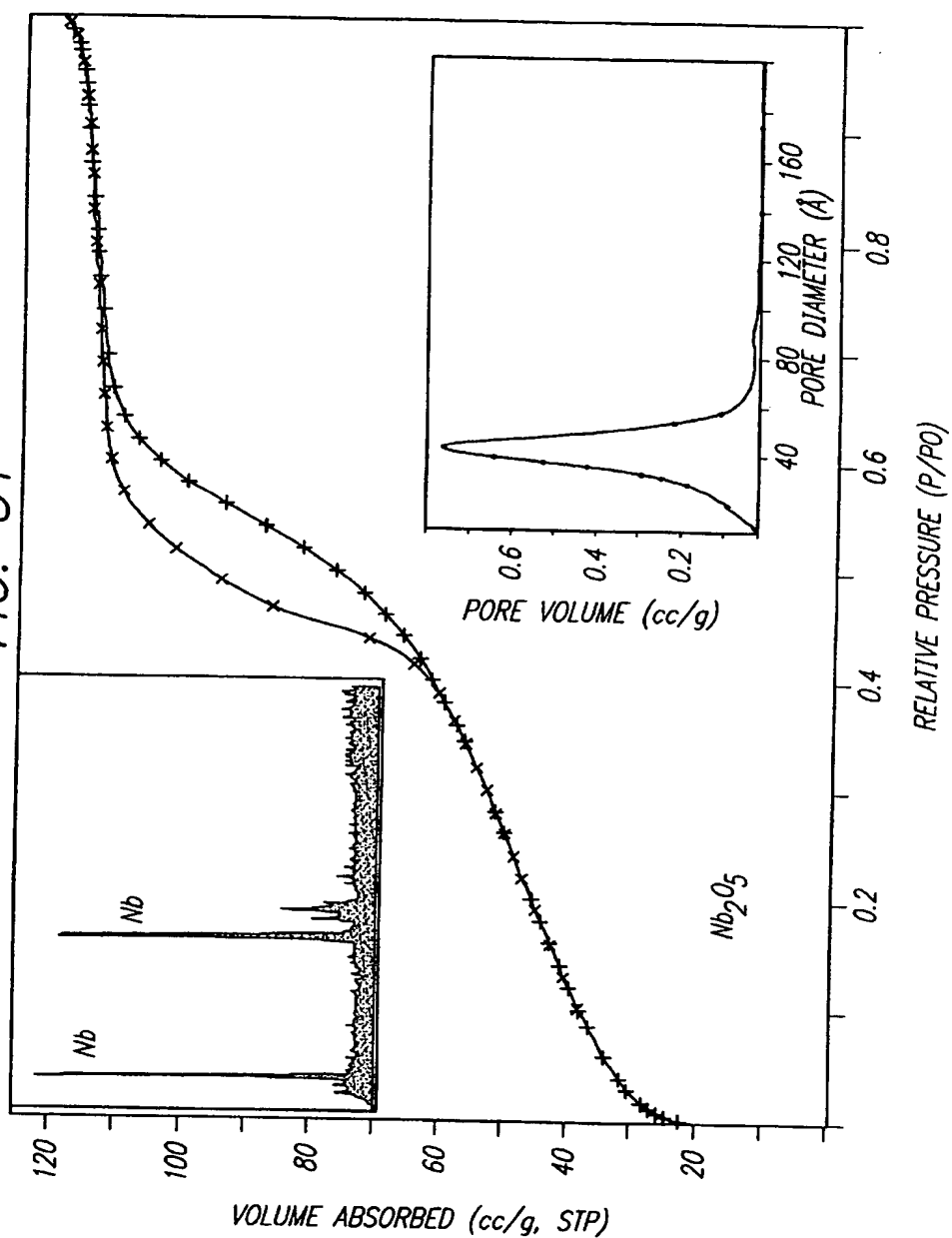


FIG. 32

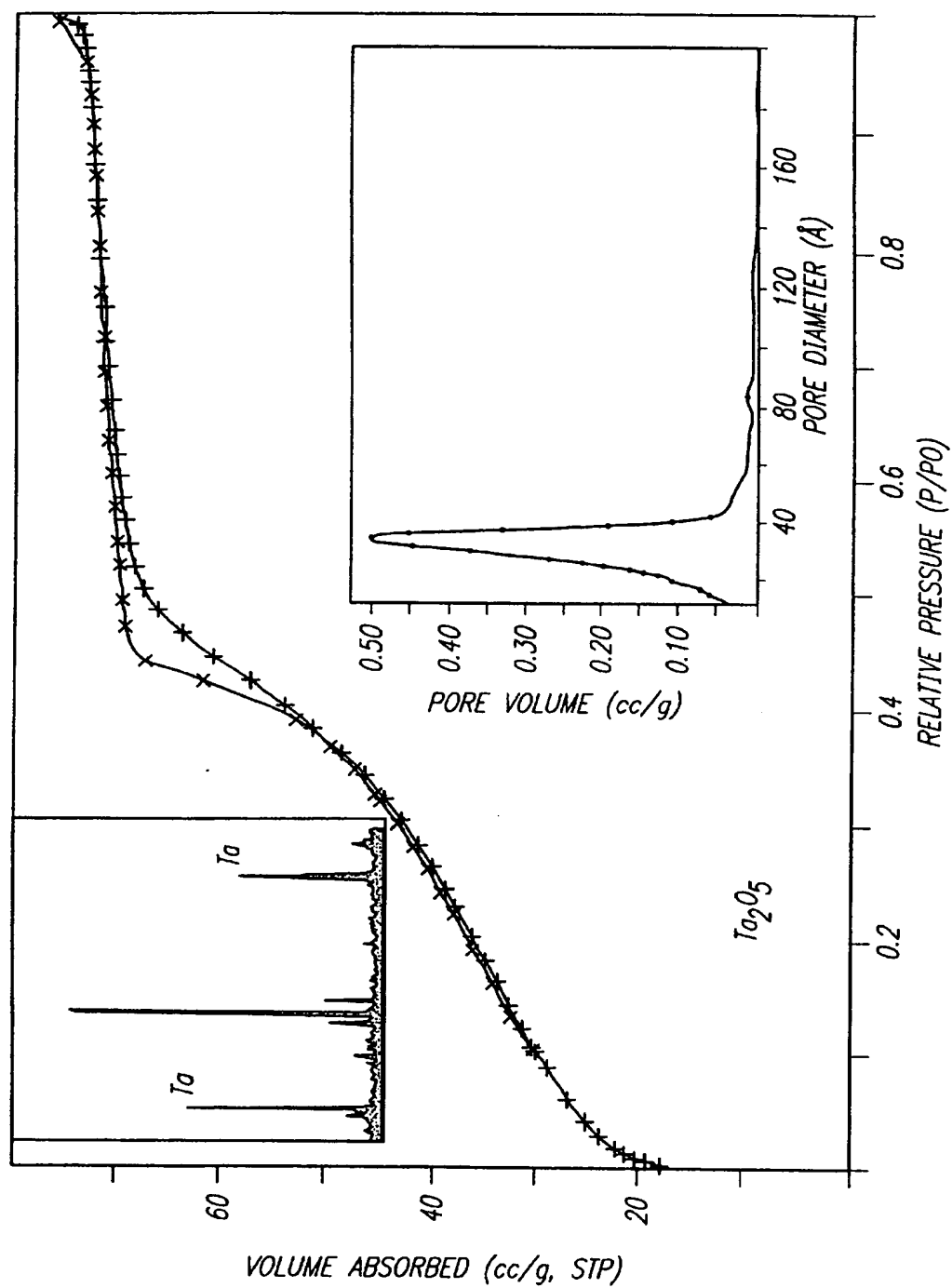


FIG. 33

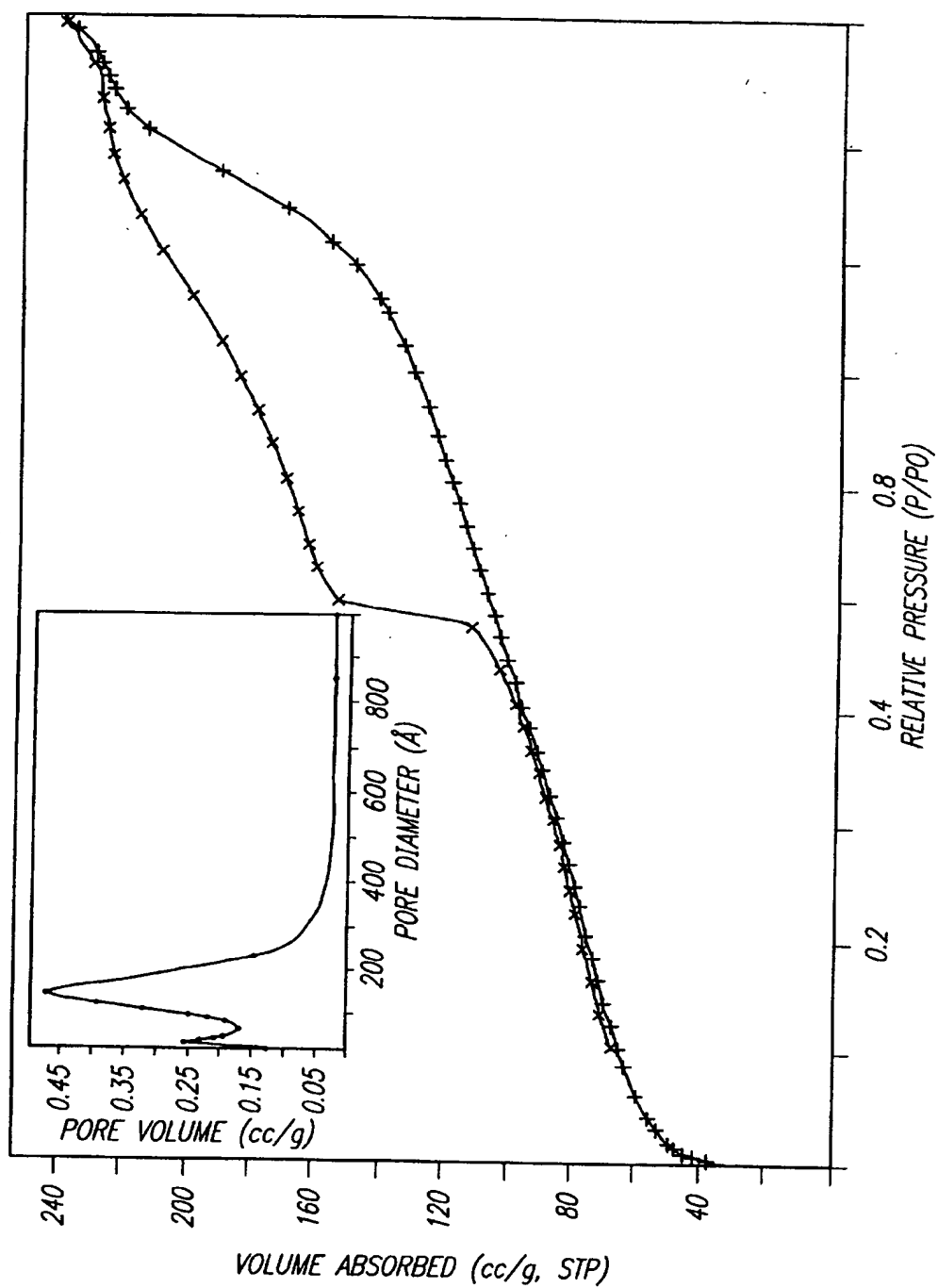


FIG. 34

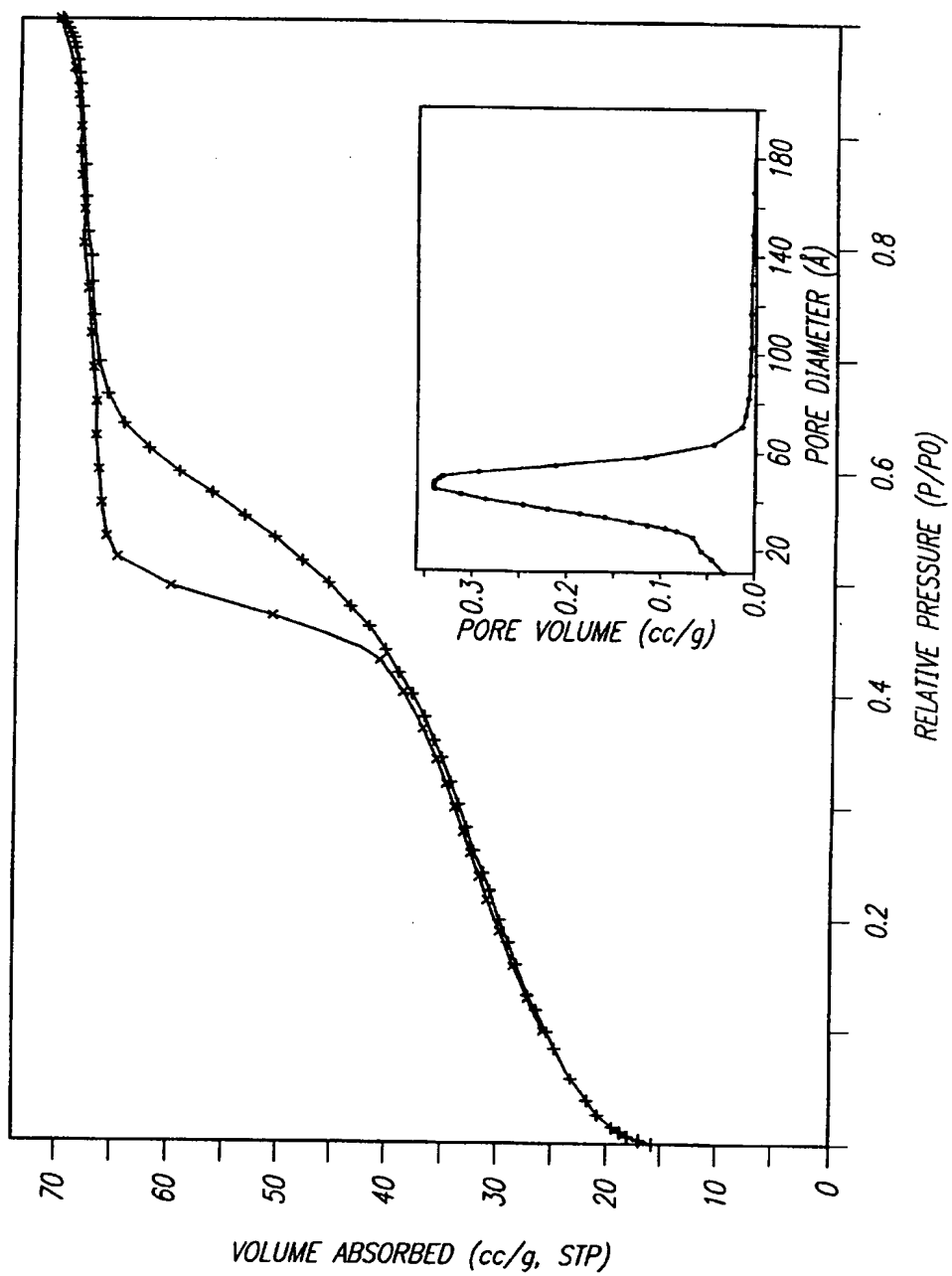


FIG. 35a

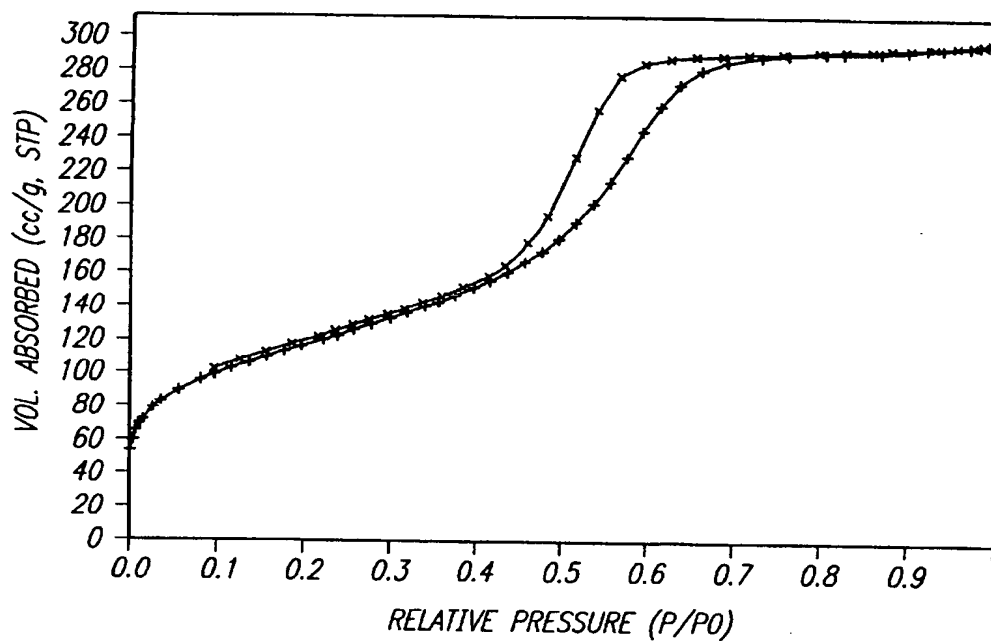


FIG. 35b

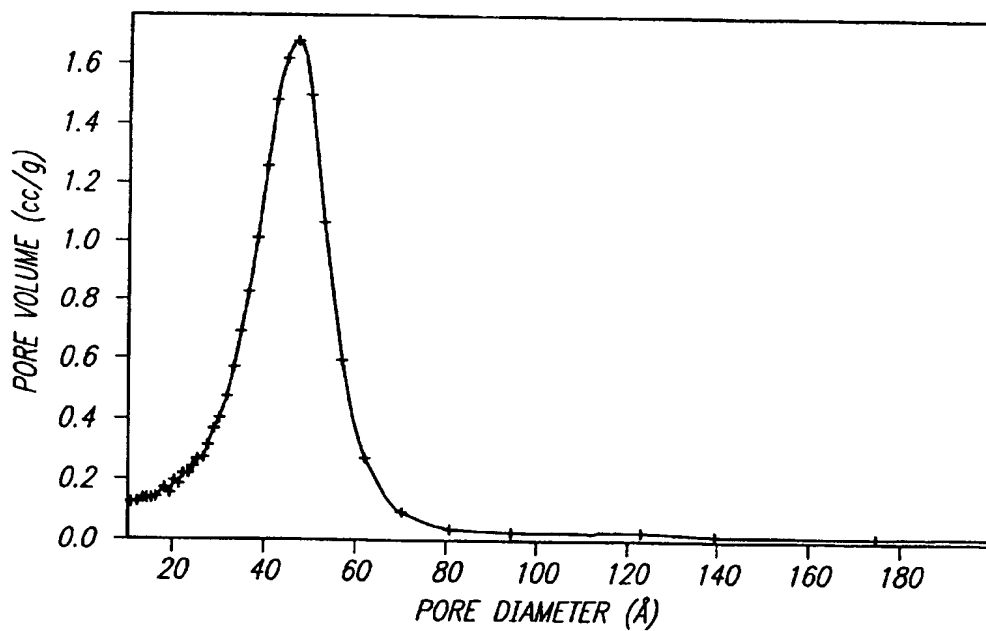


FIG. 36a

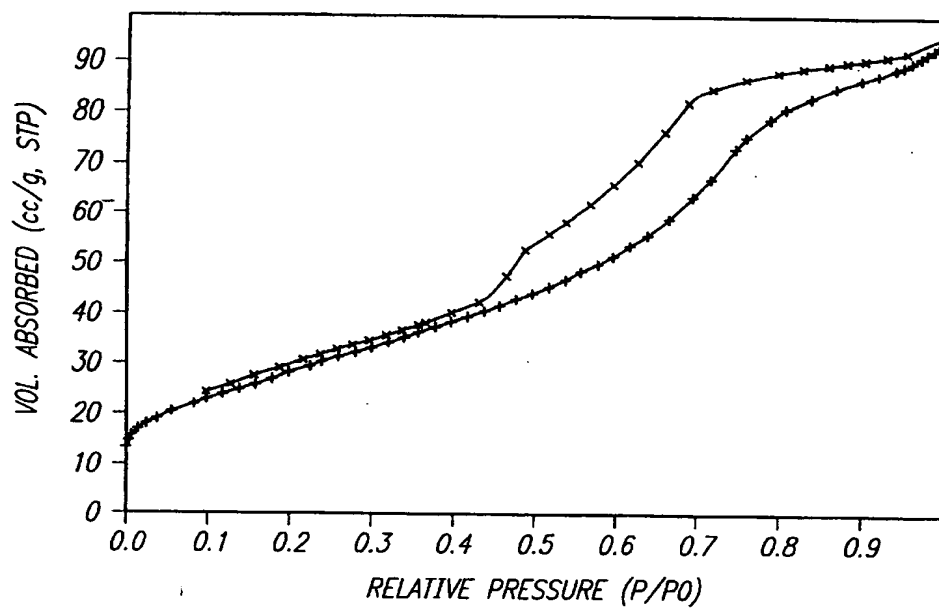


FIG. 36b

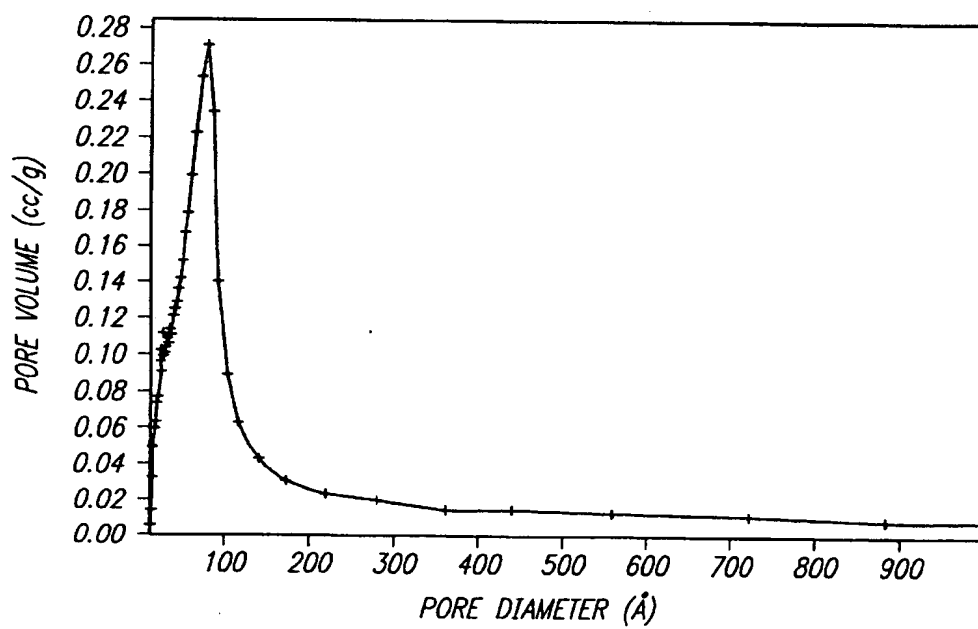
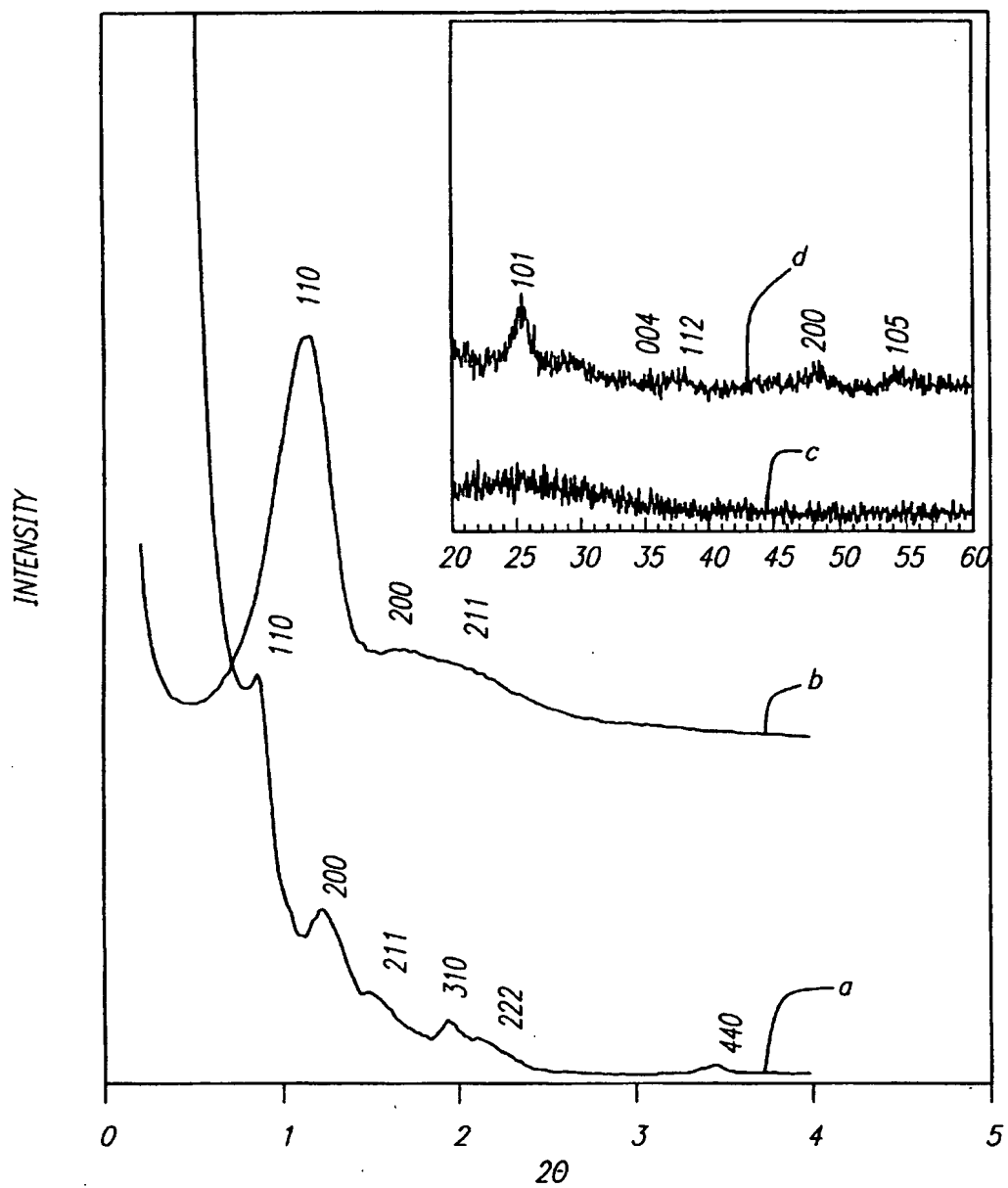


FIG. 37



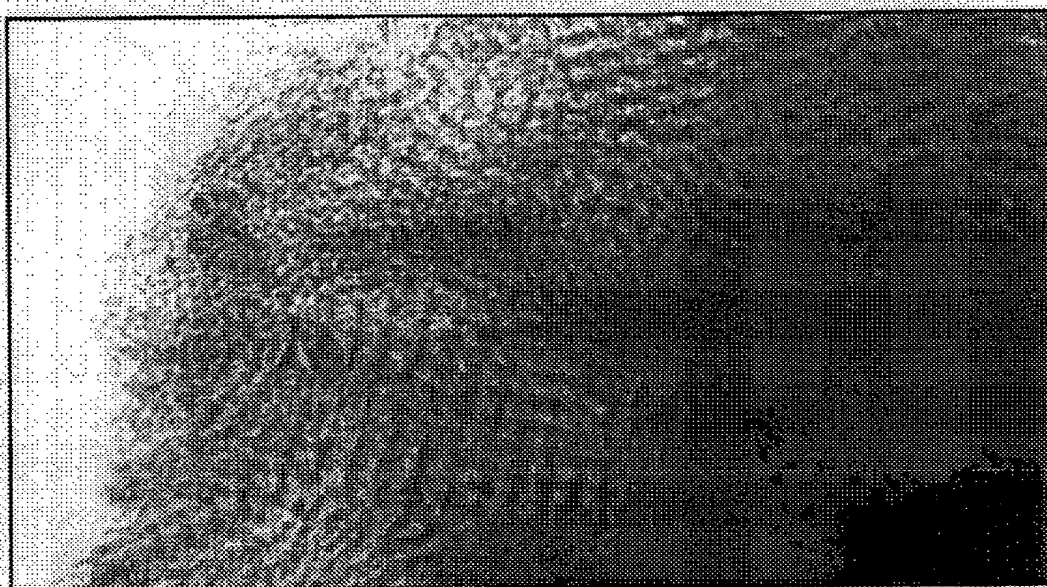


FIG. 38

20 nm

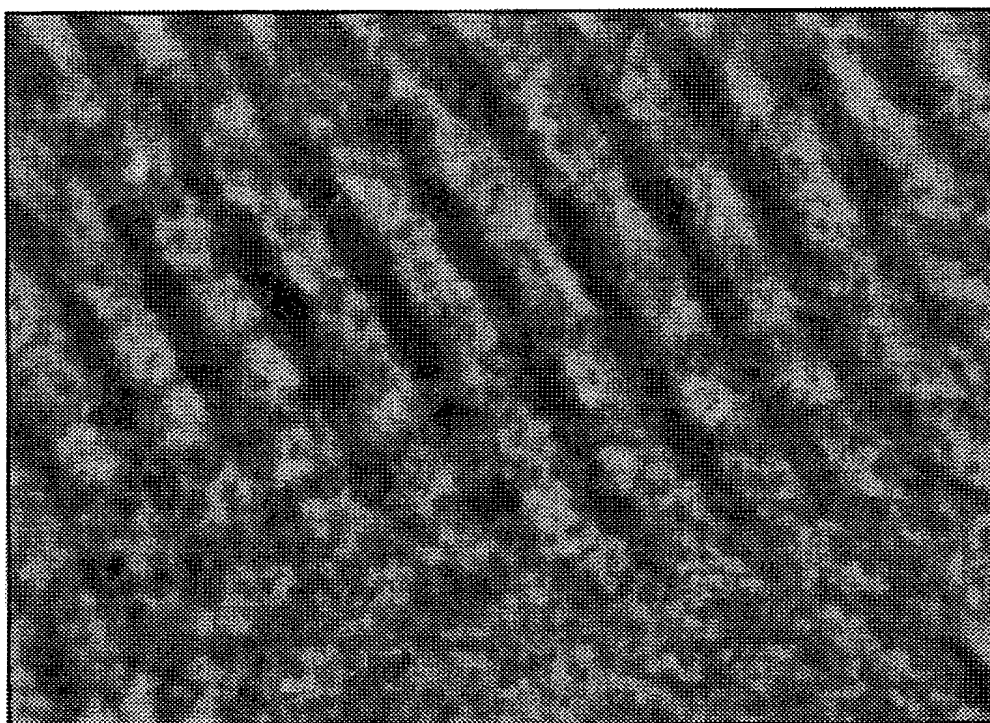
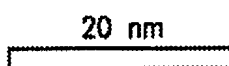


FIG. 39



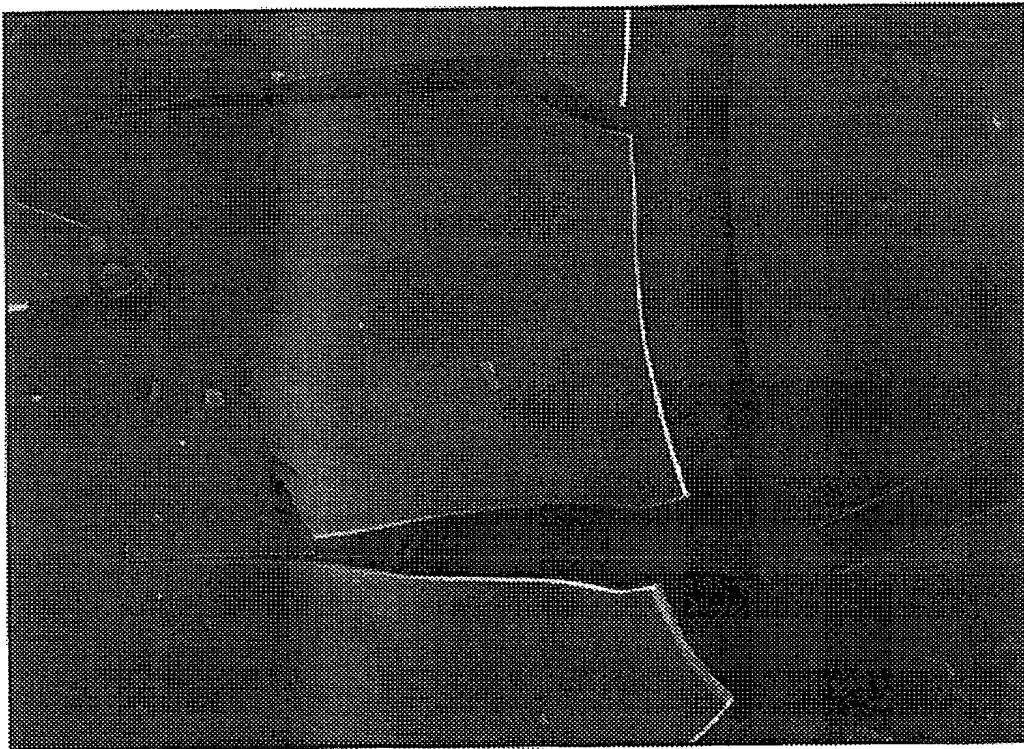


FIG. 40 10 μm

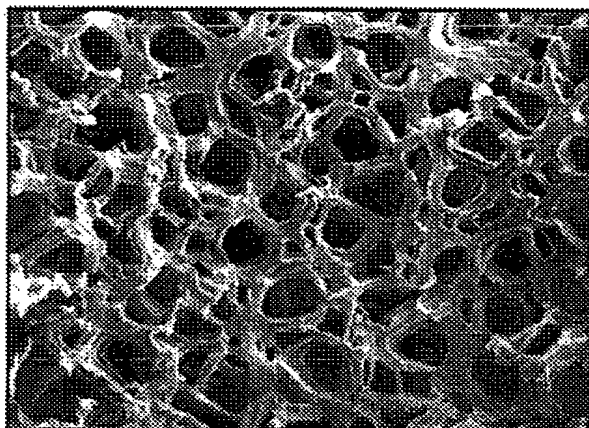


FIG. 41a

10 μm
0 kV X 3.000 12mm

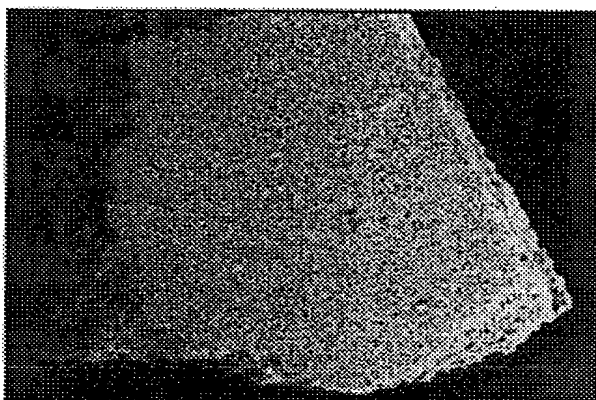


FIG. 41b

0.1 mm

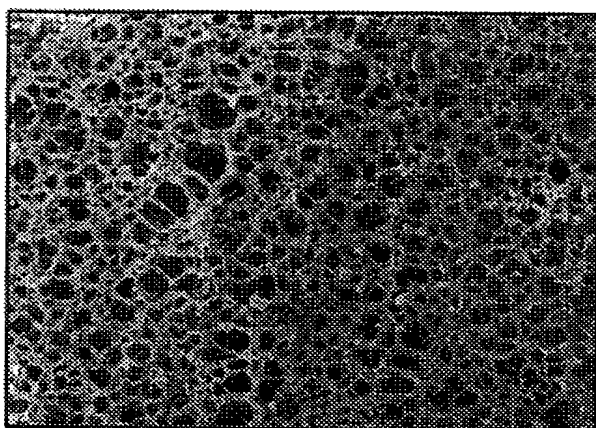


FIG. 41c

1 nm

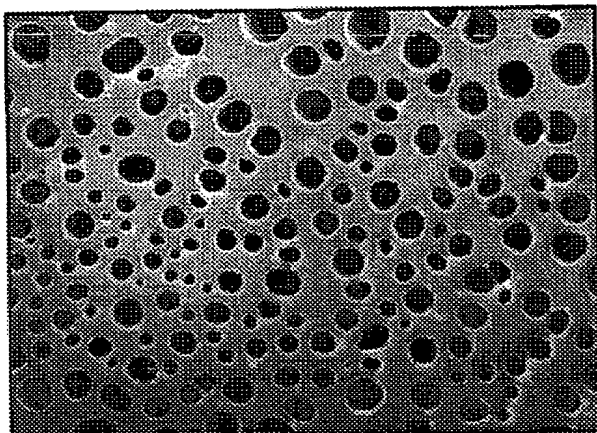


FIG. 41d

10 μm
3.0 kV x 1.300 10mm

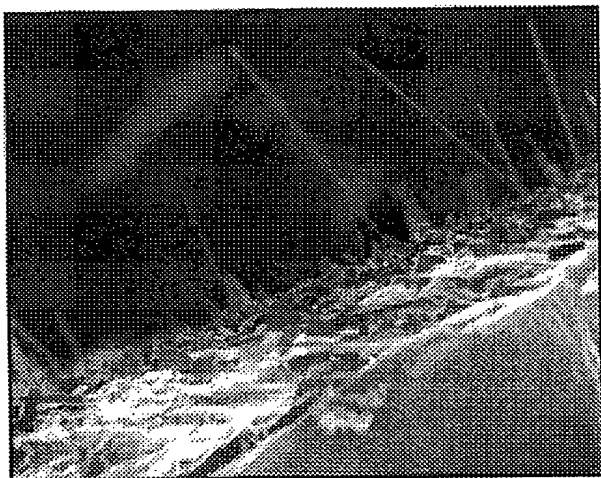


FIG. 41e

10 μm

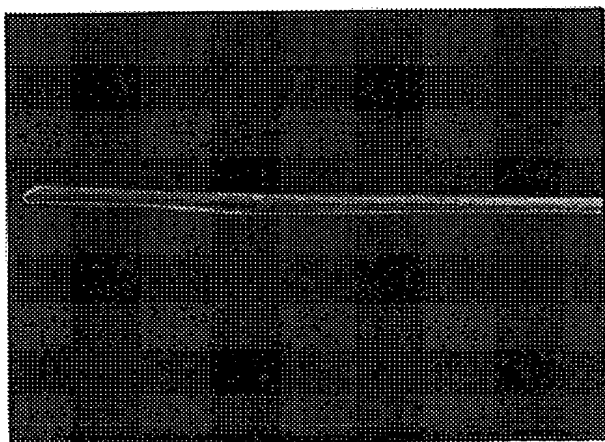
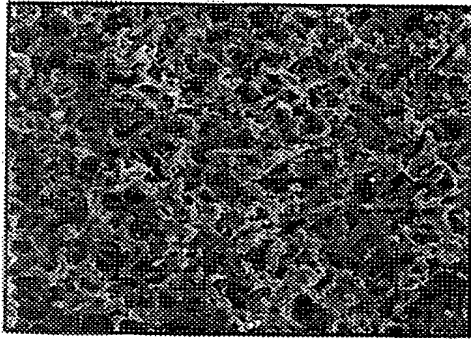


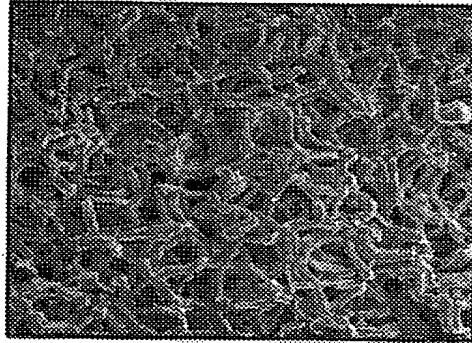
FIG. 41f

1 μm
3.0 kV x 5.500 11mm



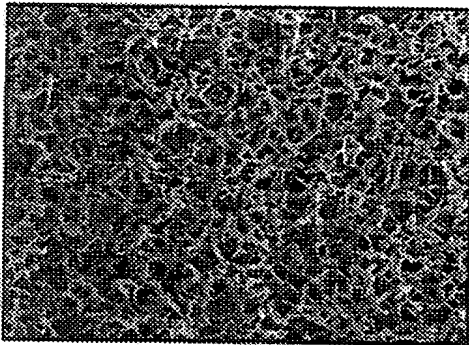
JEOL 3.0 kV X 2.530 10 μ m 12mm

FIG. 42a



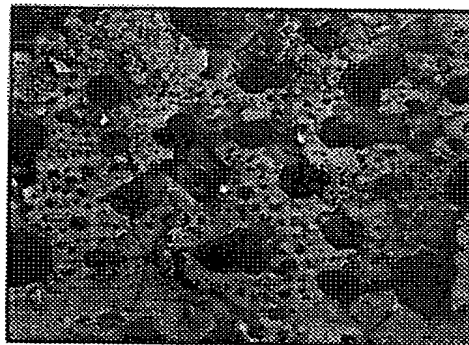
— 1 μ m
3.0 kV X 5.000 12mm

FIG. 42b



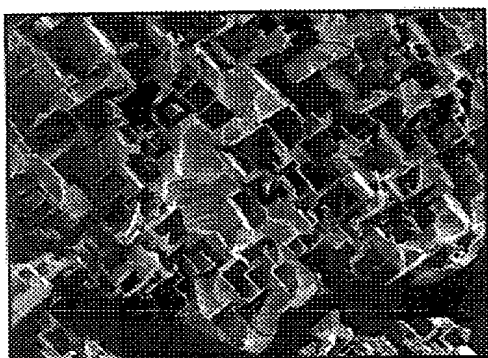
10 μ m
3.0 kV X 2.700 11mm

FIG. 42c



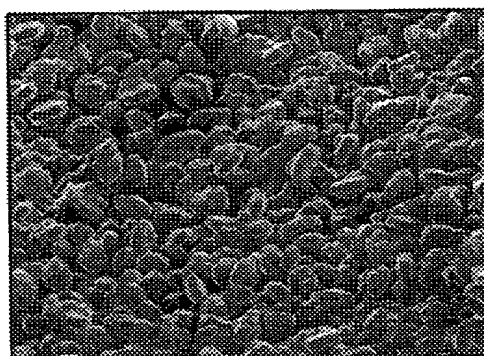
100 μ m
JEOL 3.0 kV X 160 1.1mm

FIG. 42d



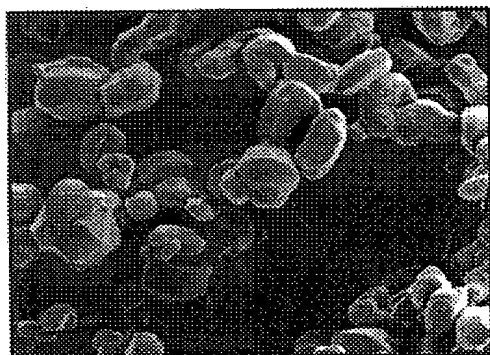
— 10 μm
3.0 kV X .550 12mm

FIG. 43a



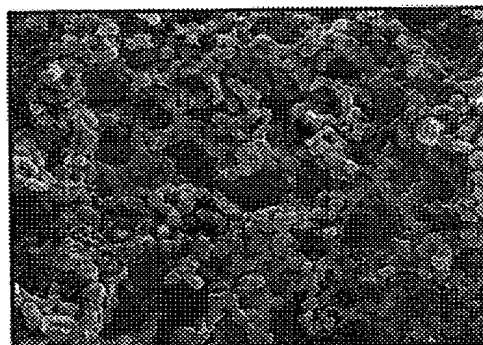
— 10 μm
3.0 kV X 1.500 11mm

FIG. 43b



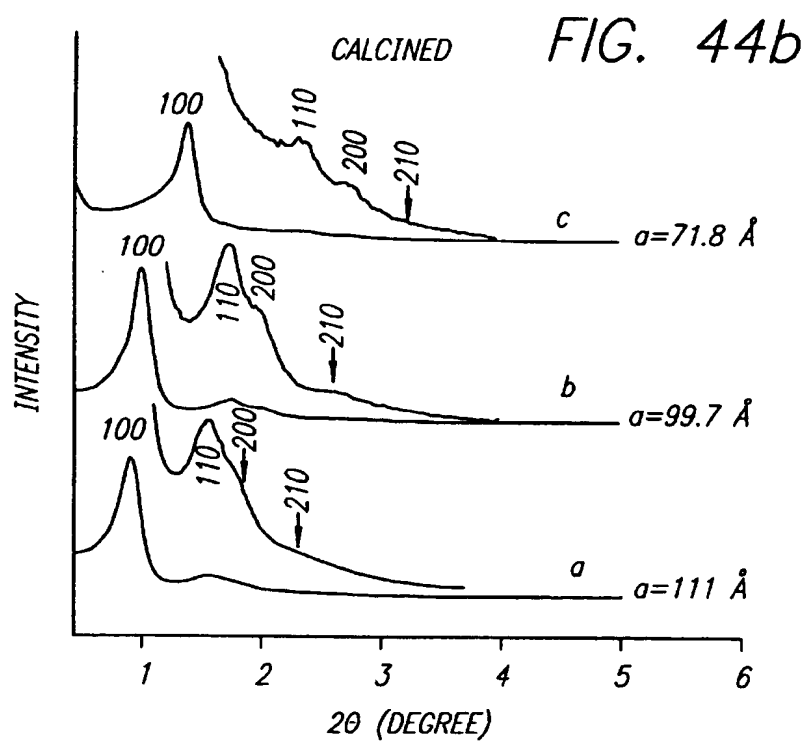
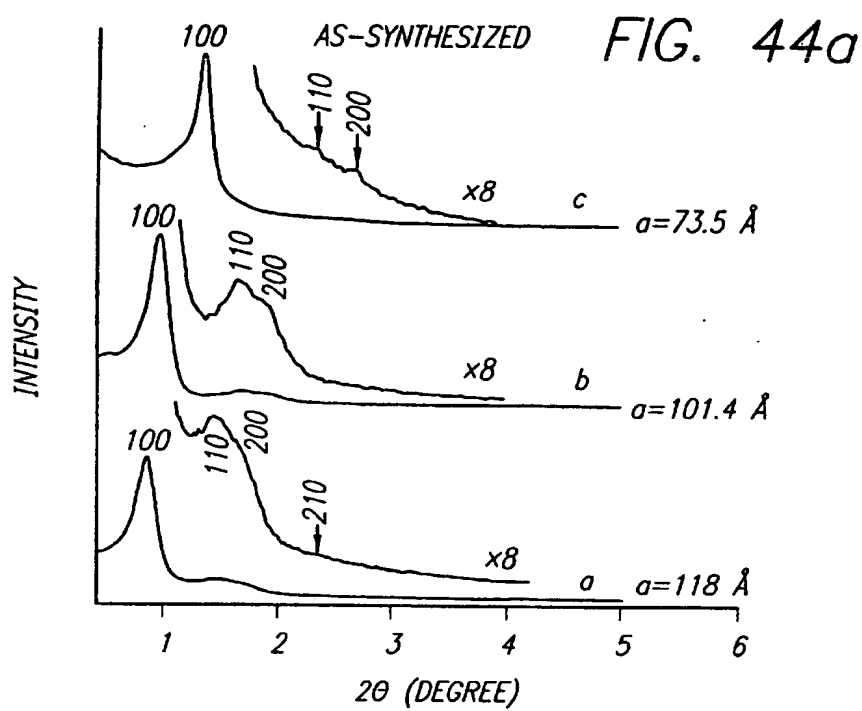
— 1 μm
3.0 kV X 5.000 12mm

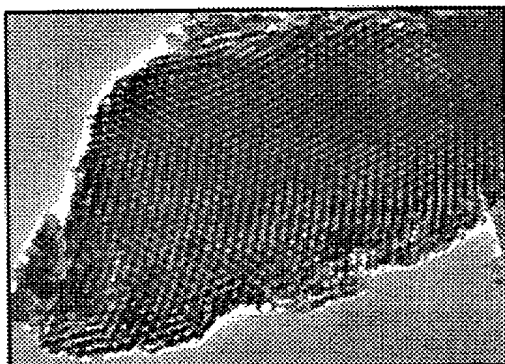
FIG. 43c



— 10 μm
3.0 kV X 1.100 11mm

FIG. 43d





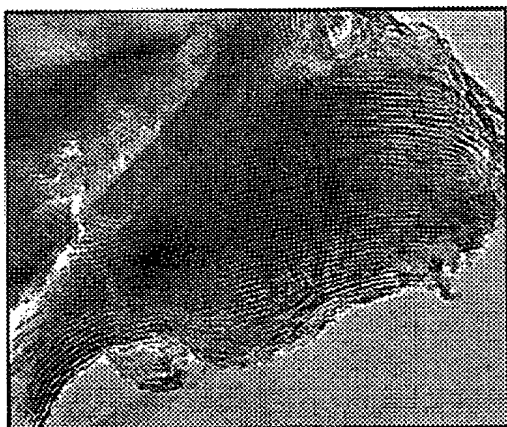
50 nm

FIG. 45a



100 nm

FIG. 45b



100 nm

FIG. 45c



100 nm

FIG. 45d

FIG. 46a

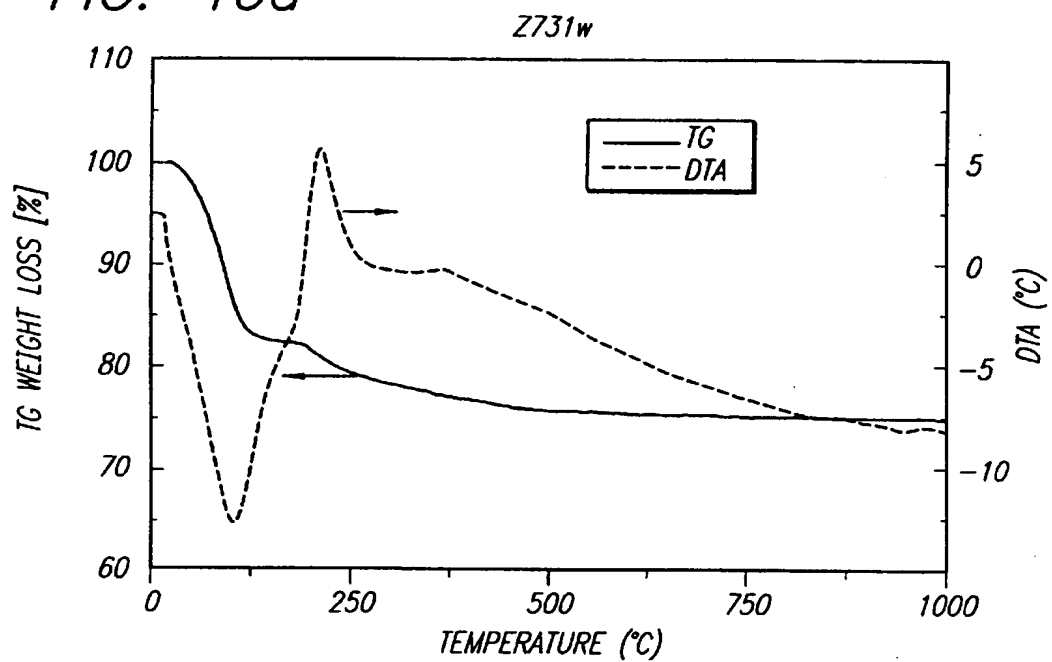


FIG. 46b

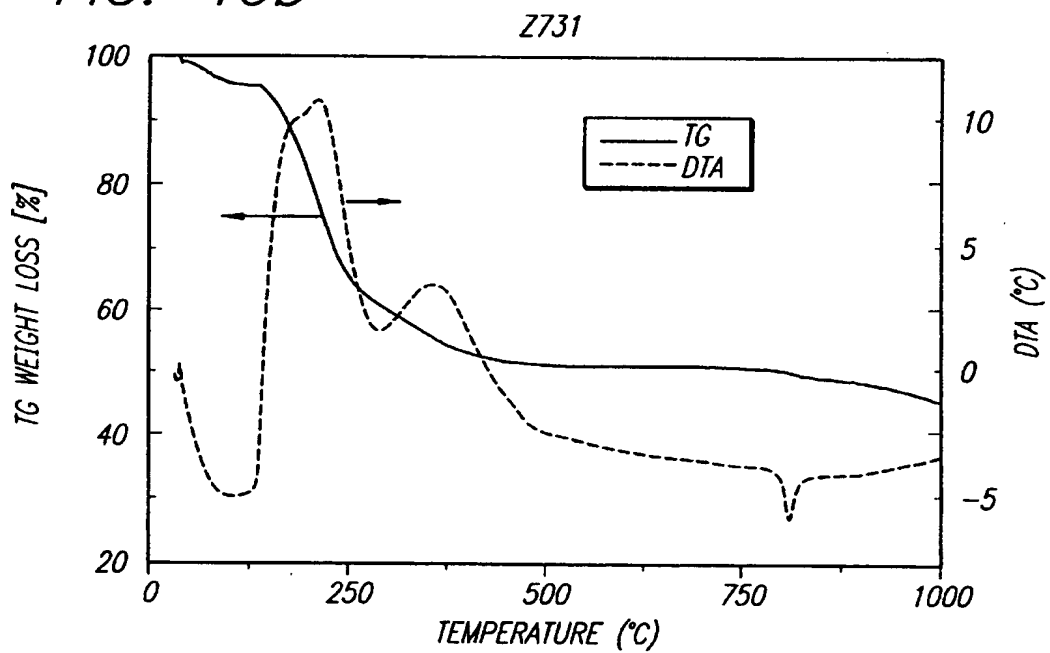


FIG. 47a

ZHAO.061 10:12:48 AM 8/11/98

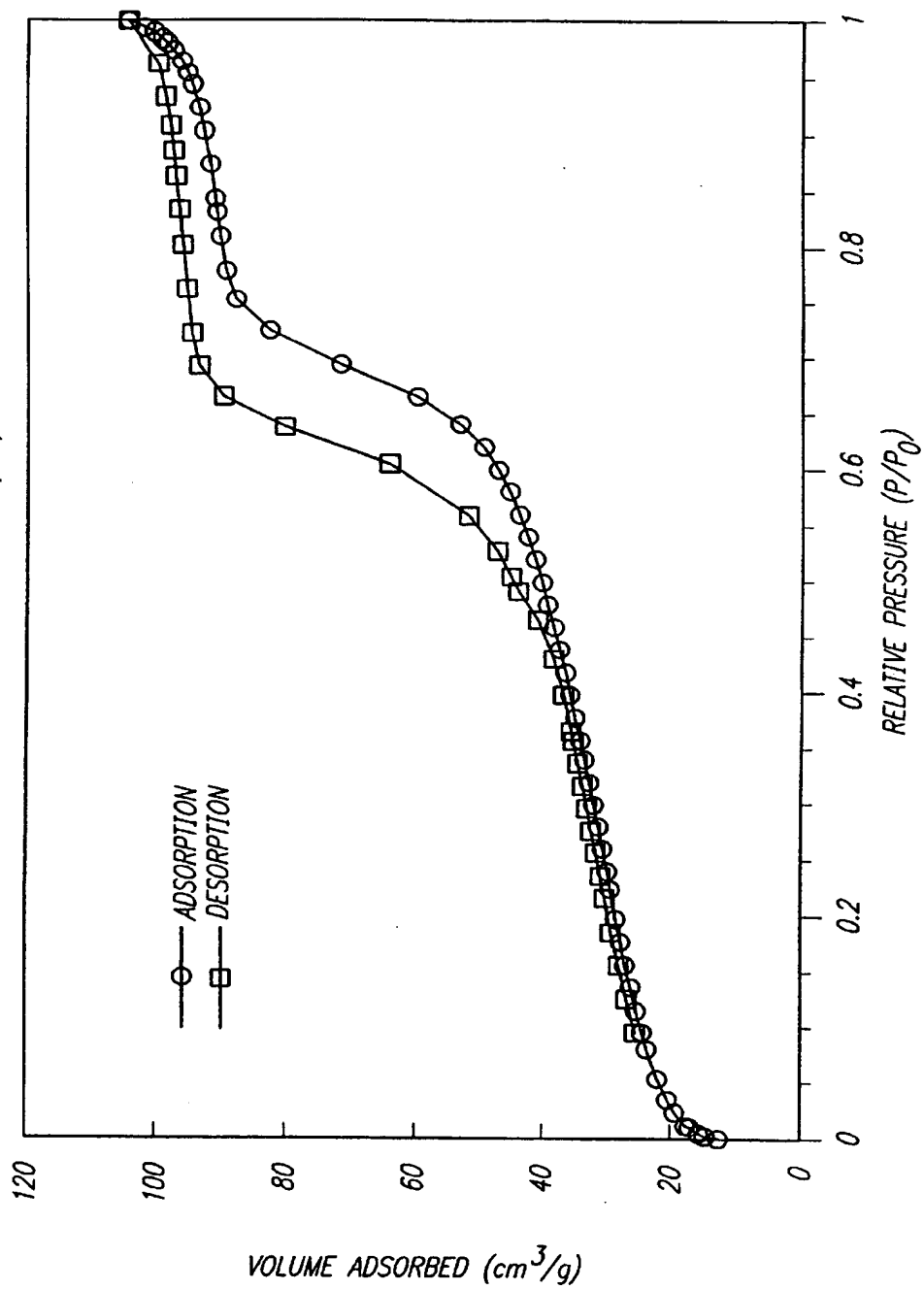


FIG. 47b

PLOT FOR ADSORPTION IN CYLINDERS

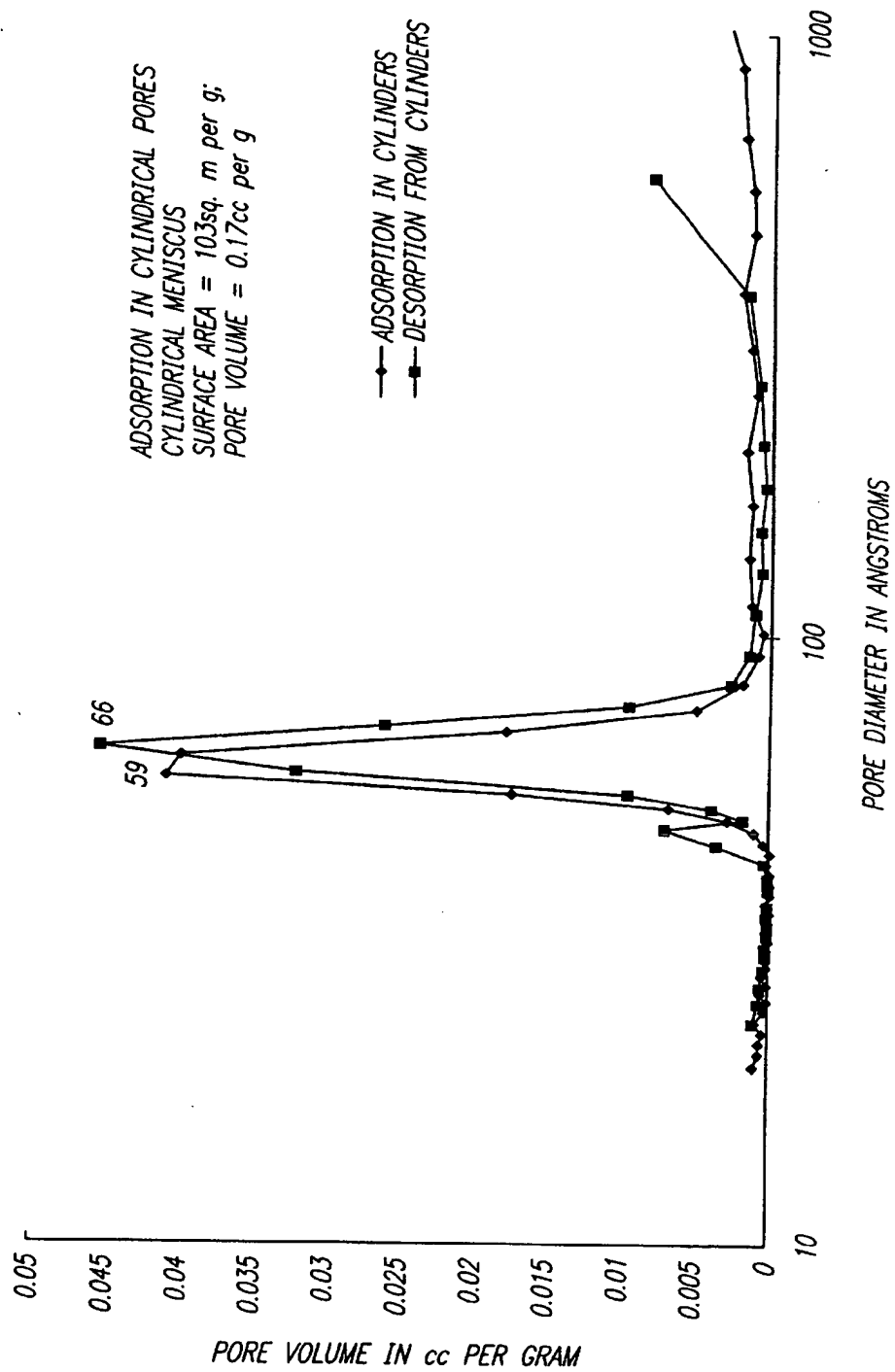


FIG. 48a

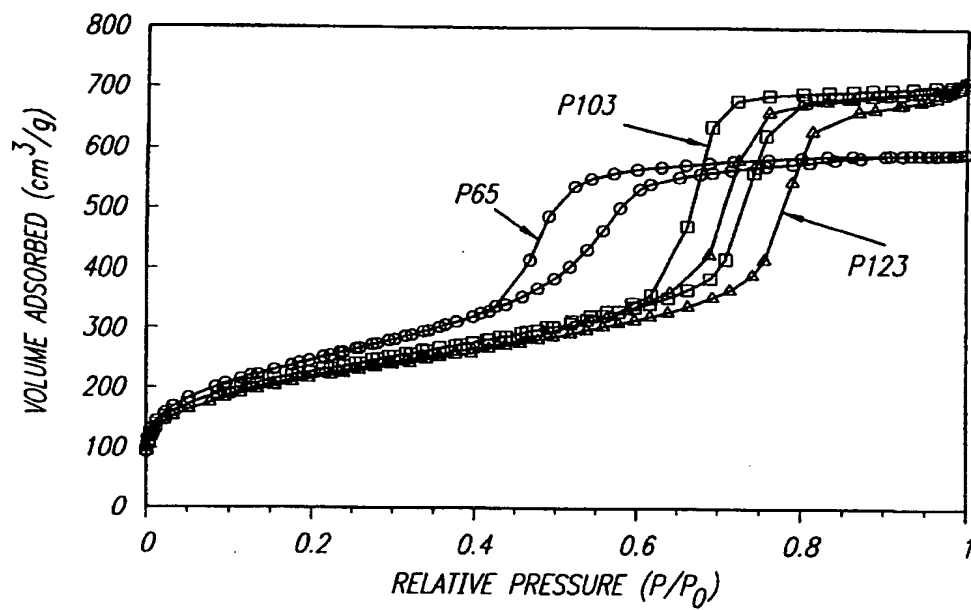


FIG. 48b

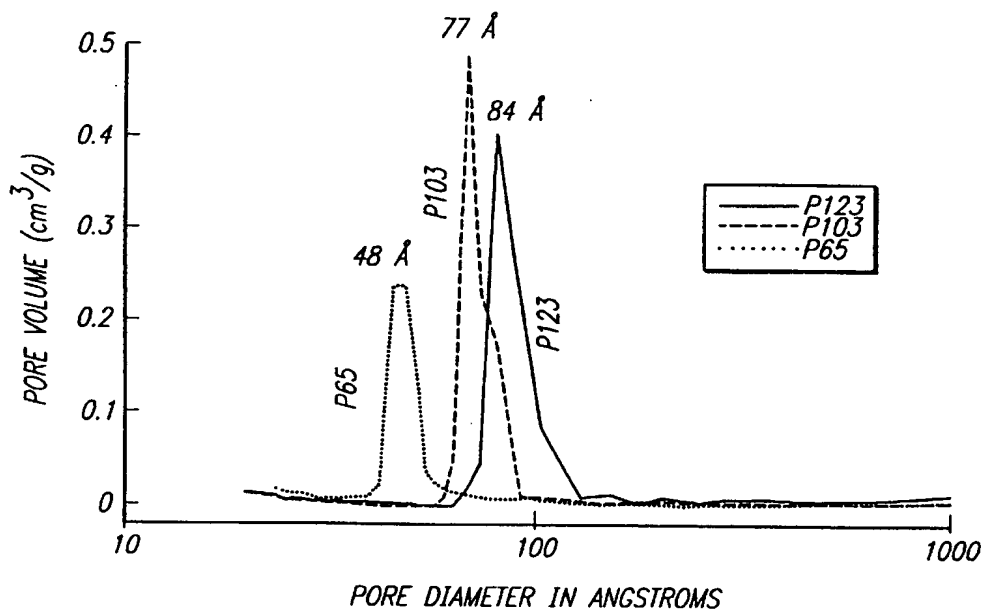


FIG. 49a

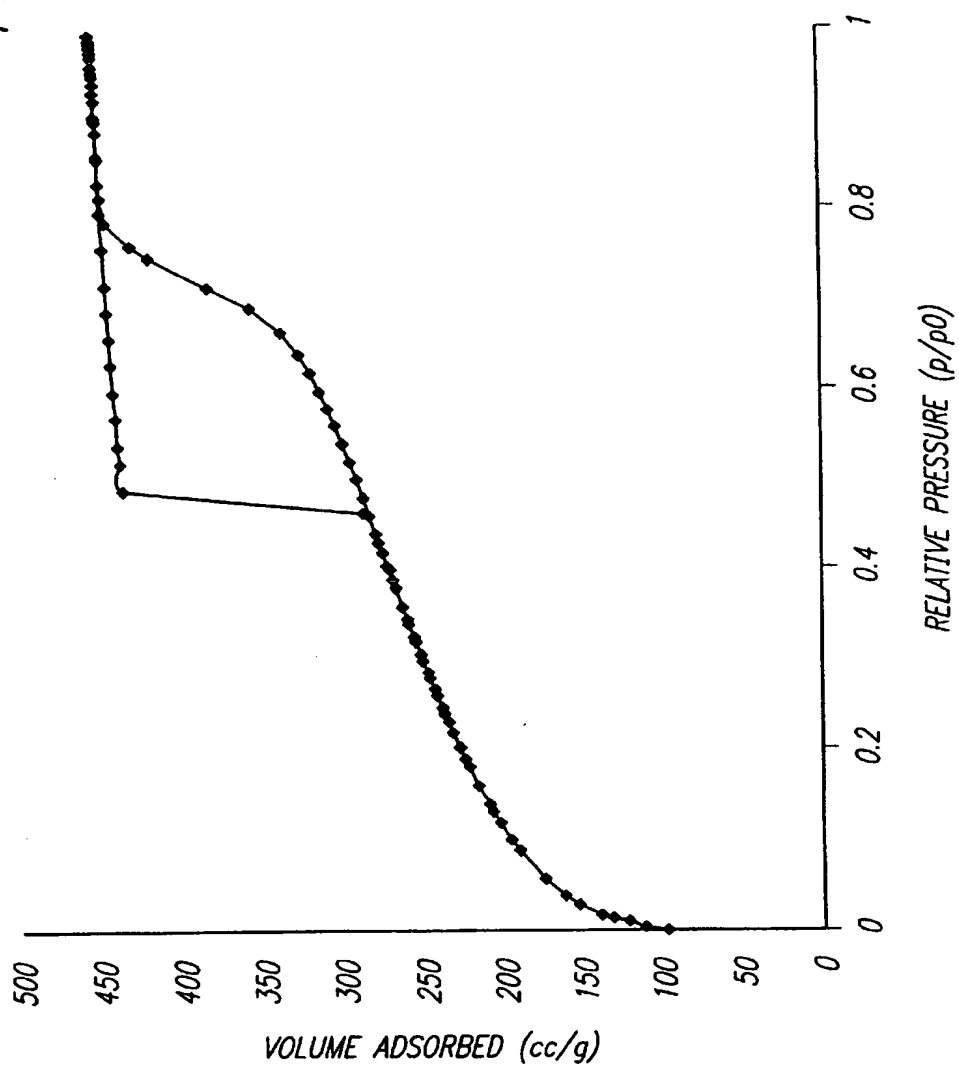


FIG. 49b

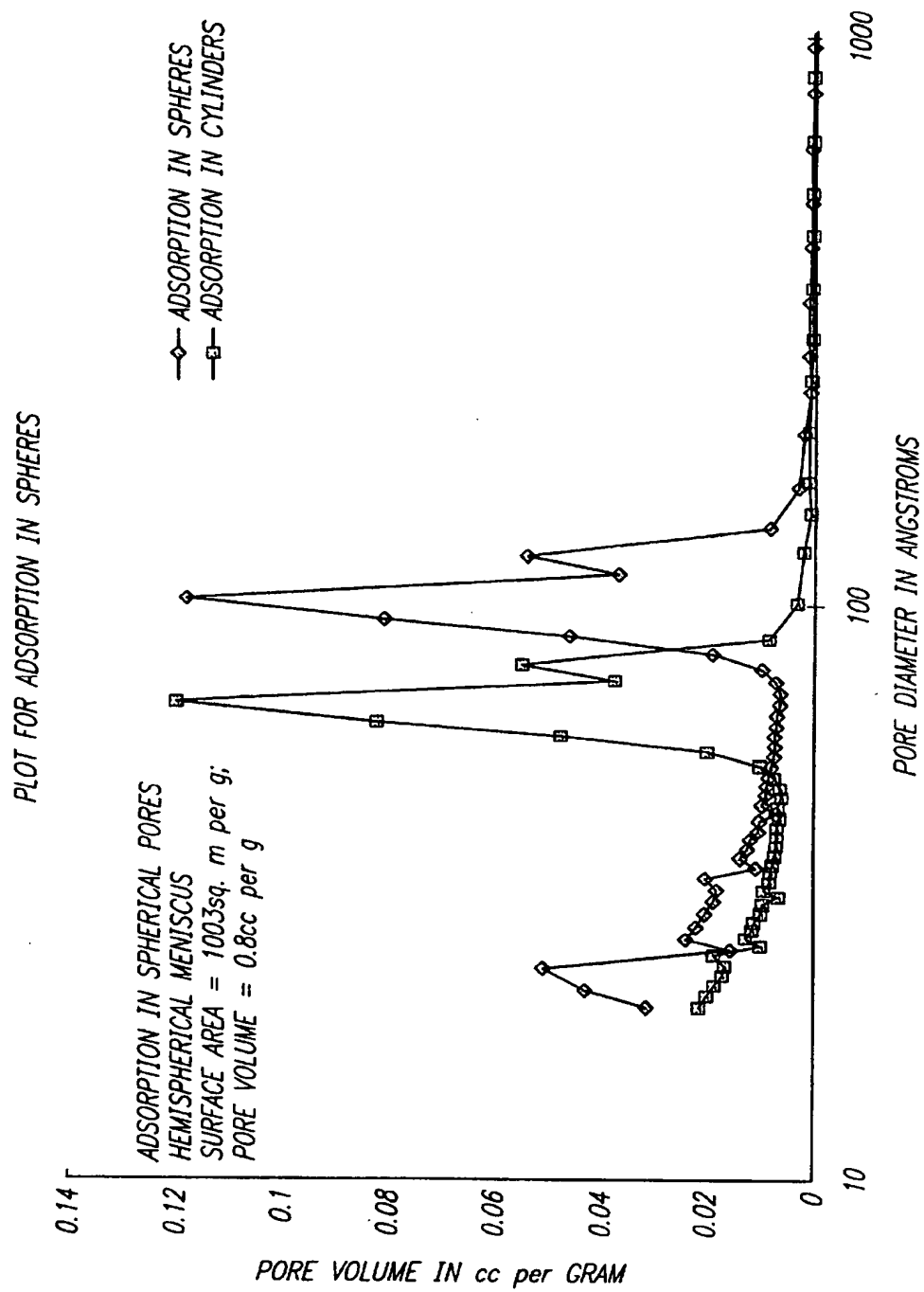


FIG. 50a

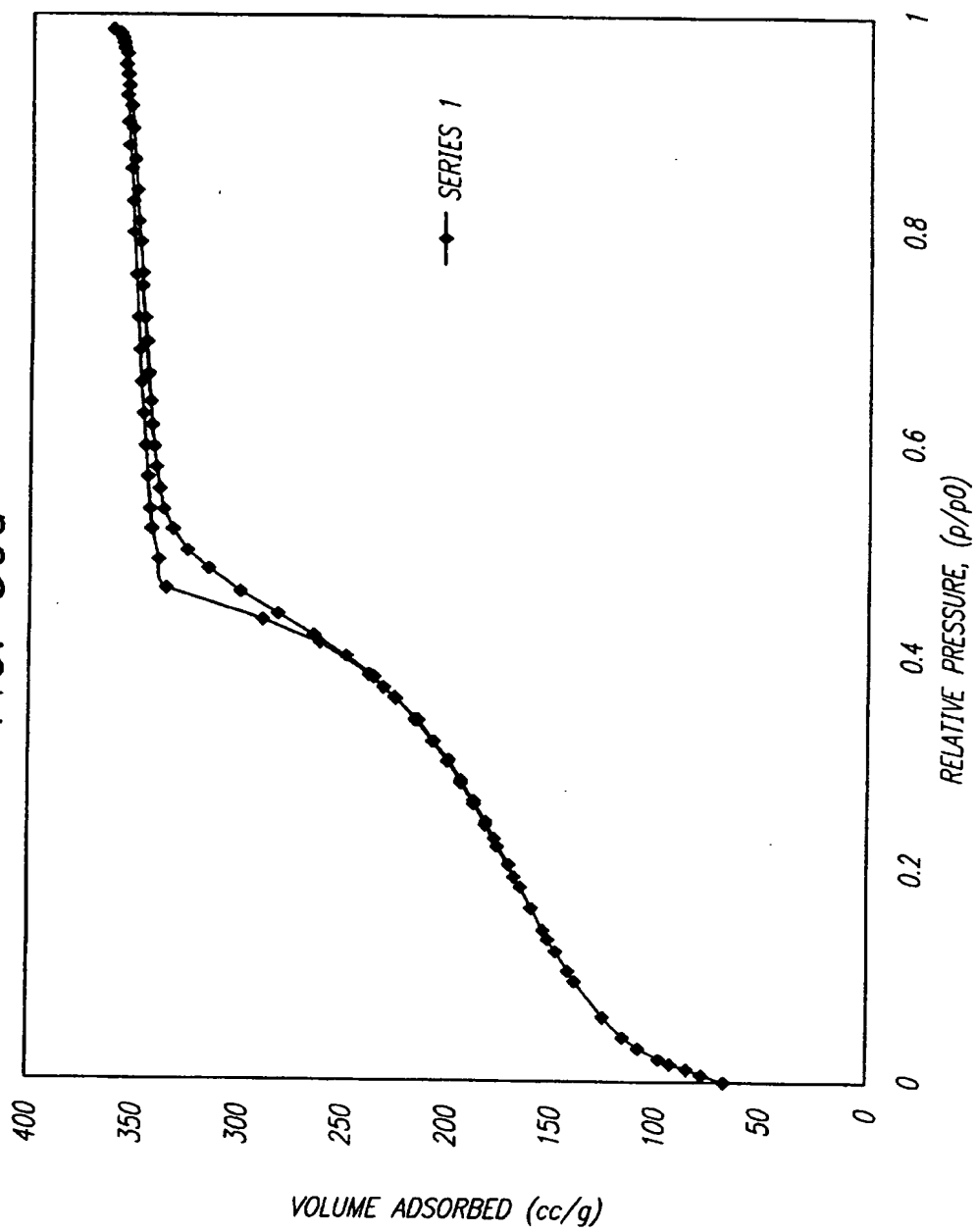
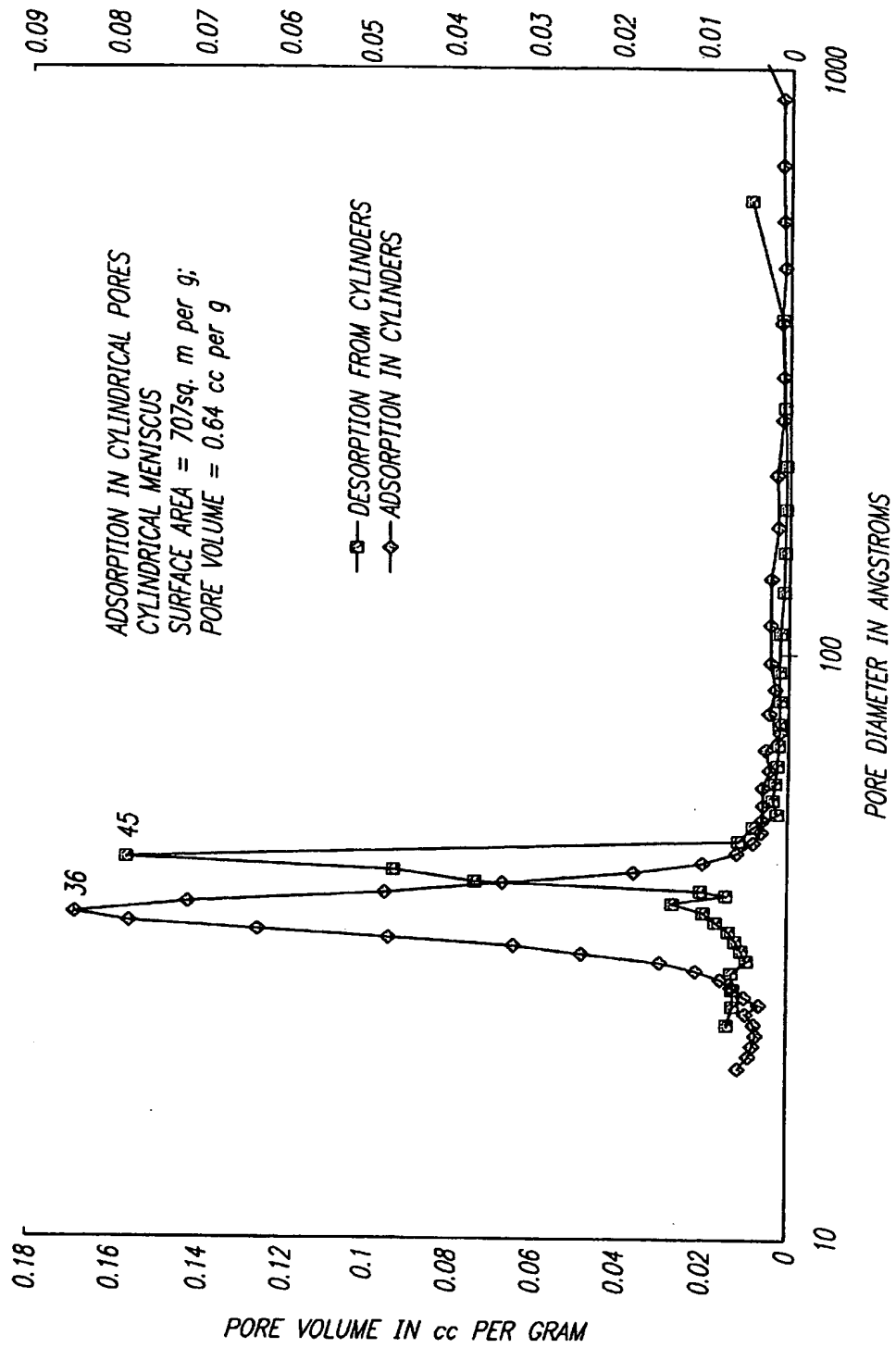
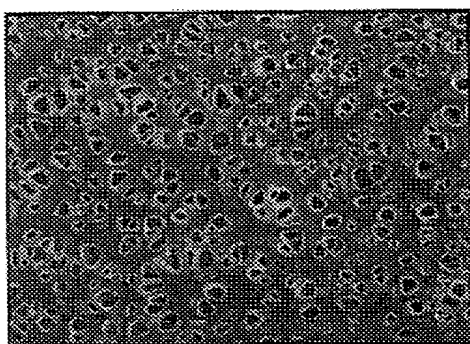


FIG. 50b

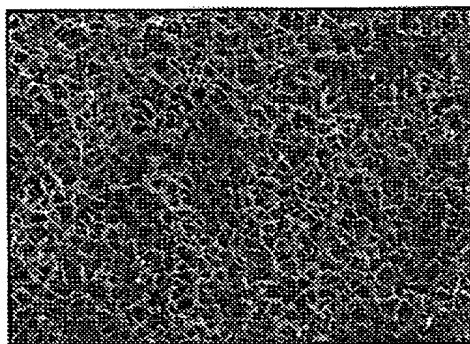
PLOT FOR ADSORPTION IN CYLINDERS





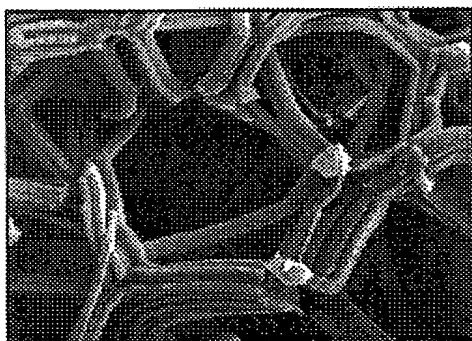
— 1 μm
3.0 kV X 4.000 12mm

FIG. 51a



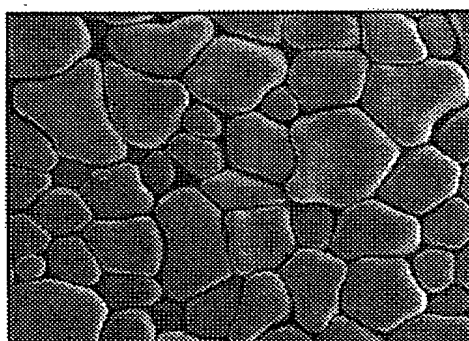
— 10 μm
3.0 kV X 1.000 12mm

FIG. 51b



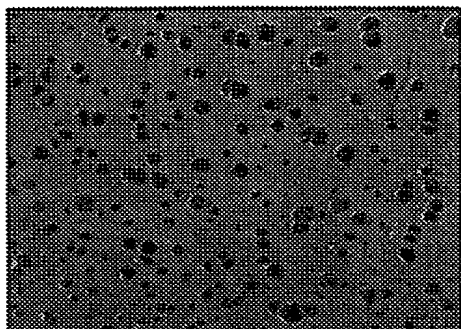
— 1 μm
3.0 kV X 20.000 11mm

FIG. 51c



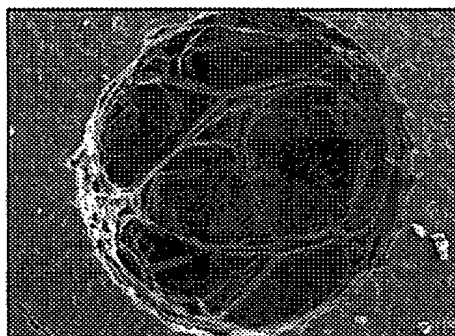
— 10 μm
3.0 kV X 500 11mm

FIG. 51d



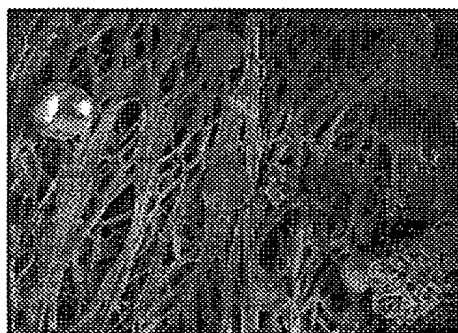
100 μm
3.00 kV X 250 12mm

FIG. 51e



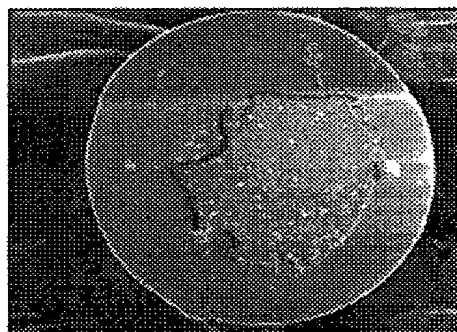
100 μm
3.00 kV X 250 12mm

FIG. 51f



10 μm
3.00 kV X 3,300 12mm

FIG. 51g



10 μm
3.00 kV X 3,300 12mm

FIG. 51h

FIG. 52

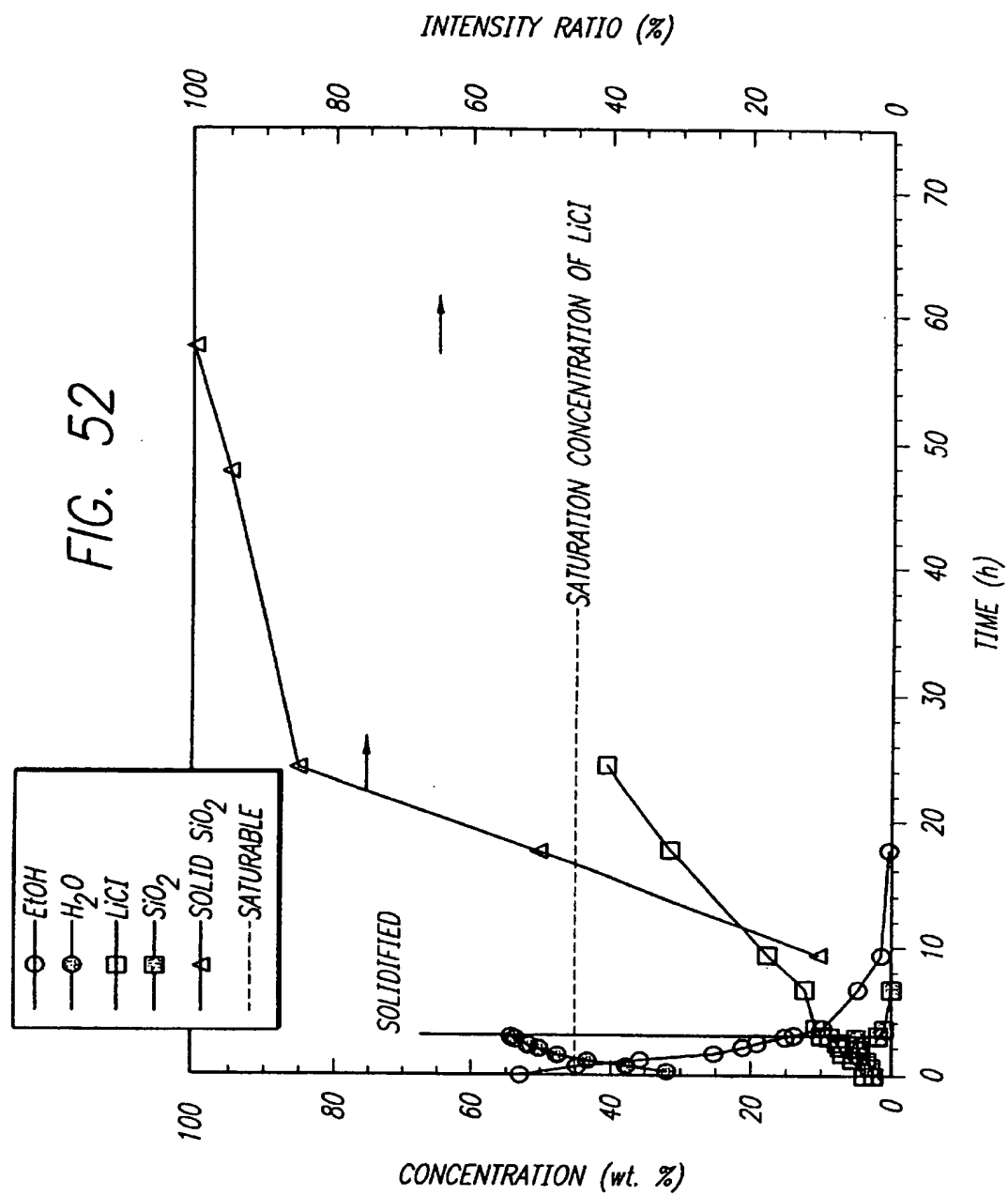
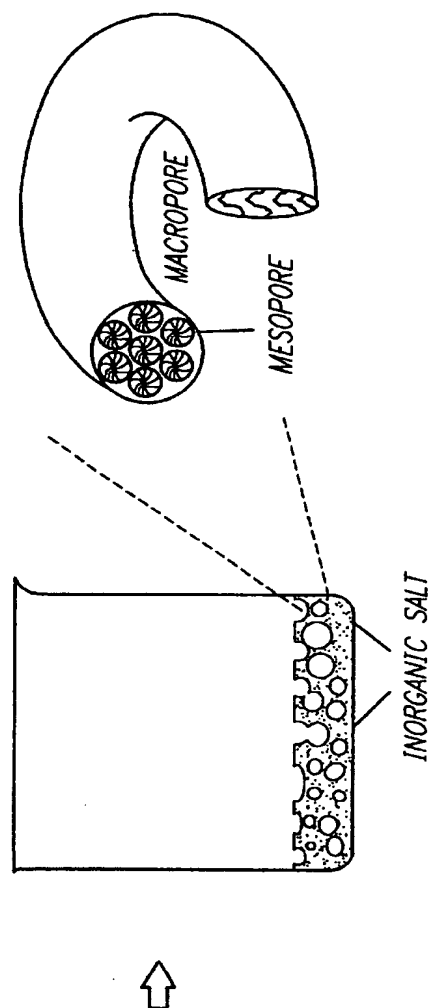
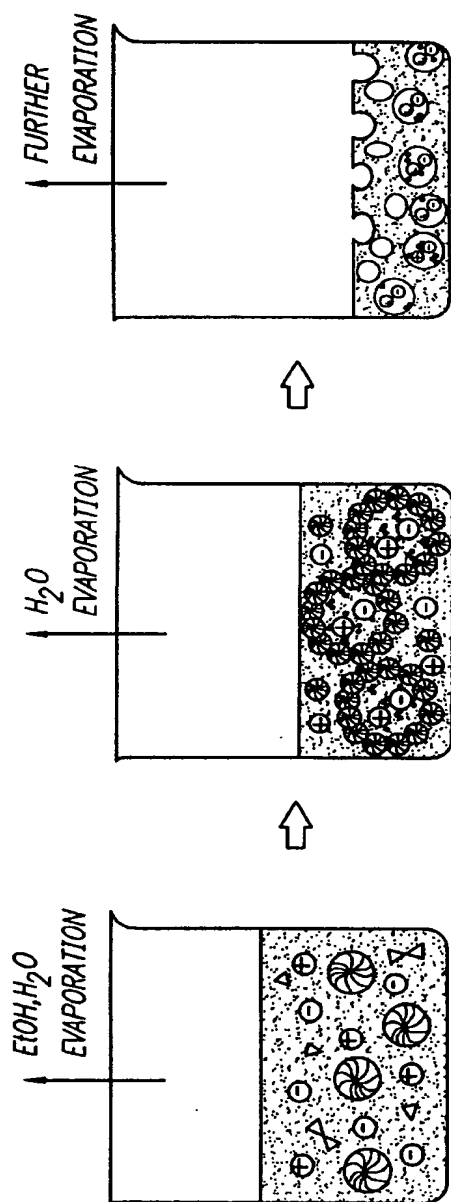


FIG. 53



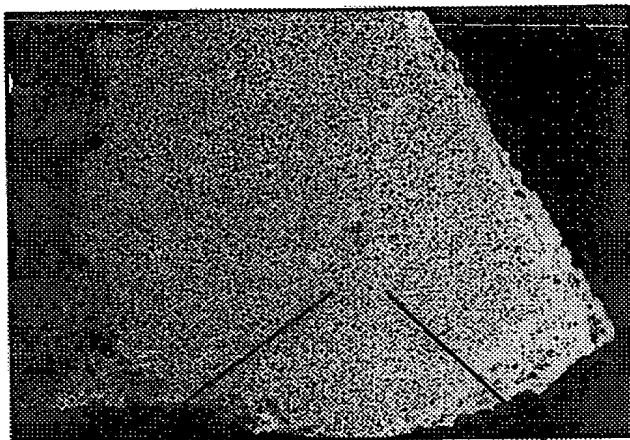


FIG. 54a

0.1 mm

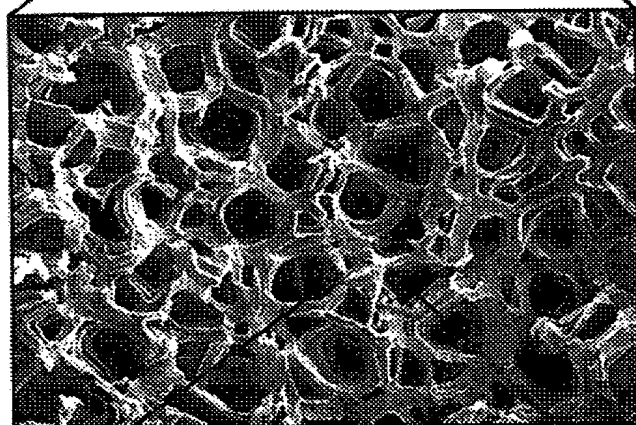


FIG. 54b

10 μ m
3.0 kV X 3.000 12mm



FIG. 54c

50 nm

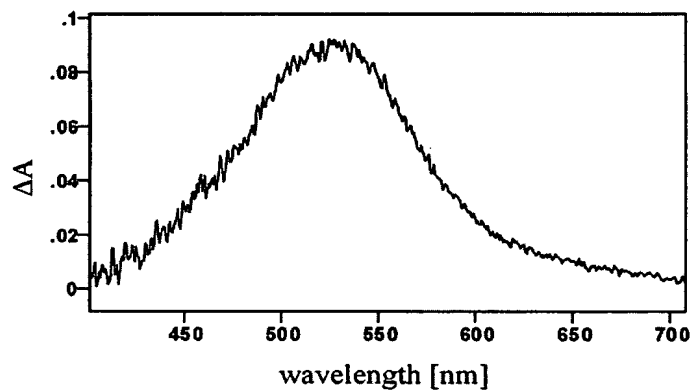
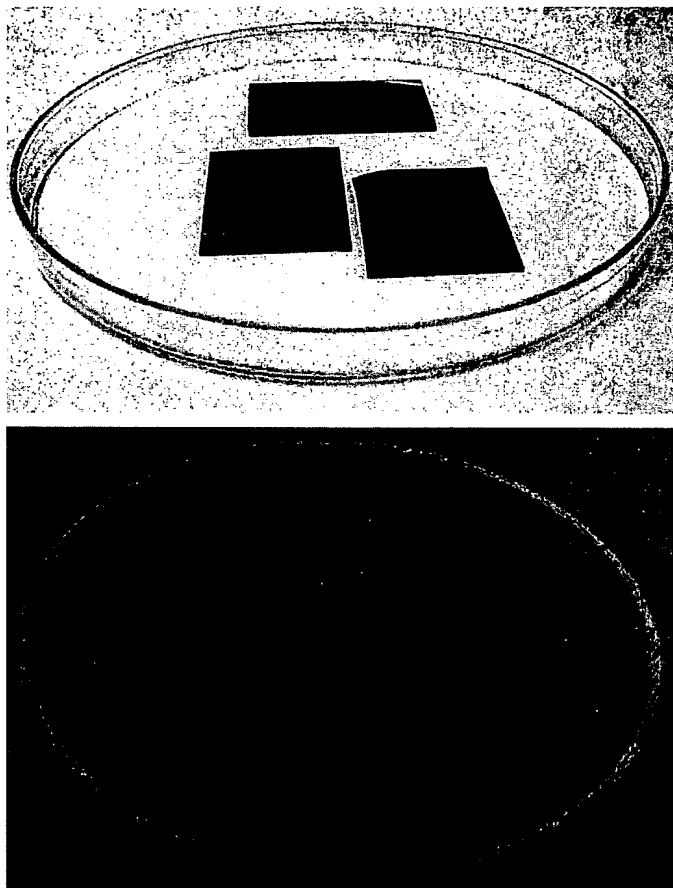


Figure 55. Messtructured 1 μm thick, silica/ $\text{EO}_{106}\text{PO}_{70}\text{EO}_{106}$ optical films under ambient and longwave irradiation. The absorption difference spectrum is for the spiropyran dye (1',3'-Dihydro-1',3',3'-trimethyl-6-nitrospiro[2*H*-1-benzopyran-2,2'-2(*H*)-indole]) employed here and excited under near-UV light (365 nm).

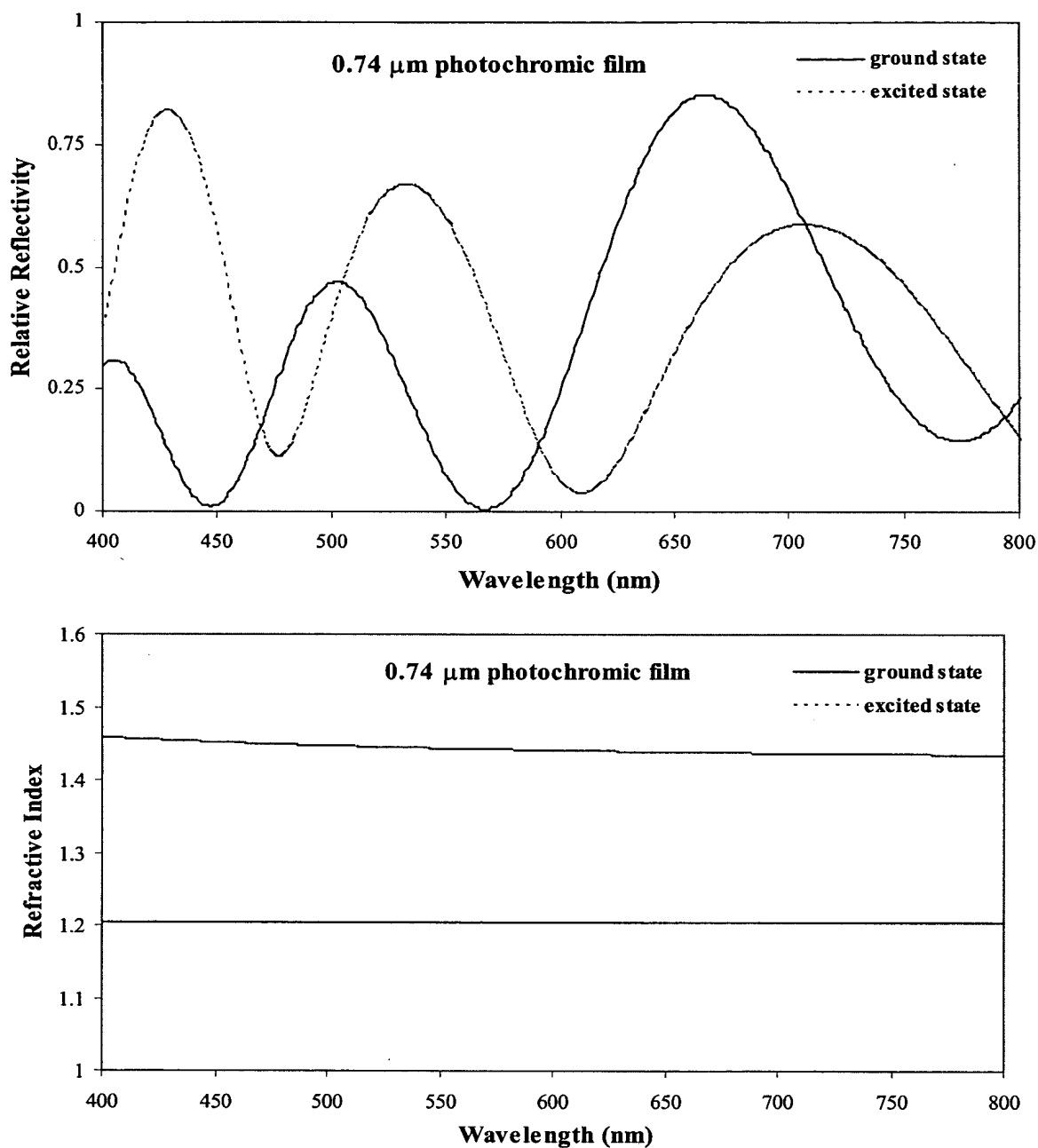


Figure 56. Examples of the observed reflectance spectra and the calculated refractive indices for the mesostructured silica/ $\text{EO}_{106}\text{PO}_{70}\text{EO}_{106}$ optical film containing the spiropyran dye in the ground state (blue, solid trace) and the excited state (red, dashed trace).

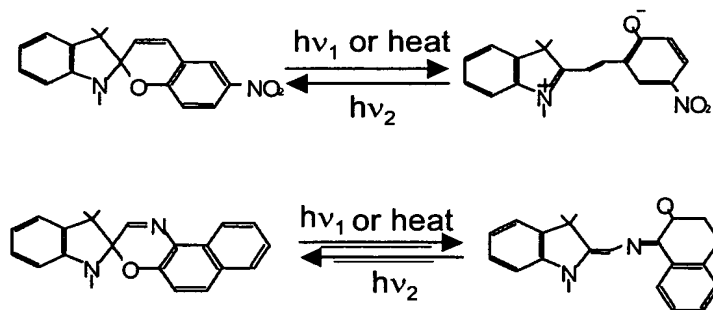
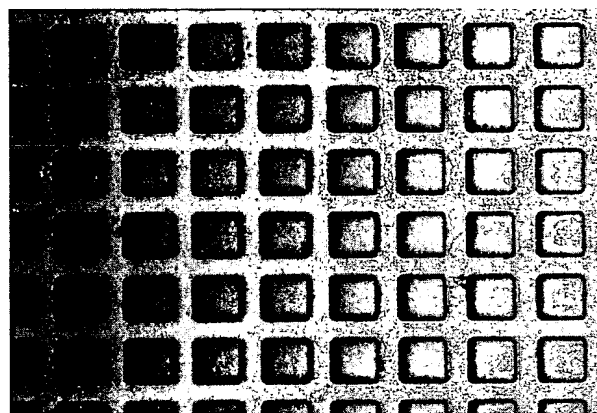
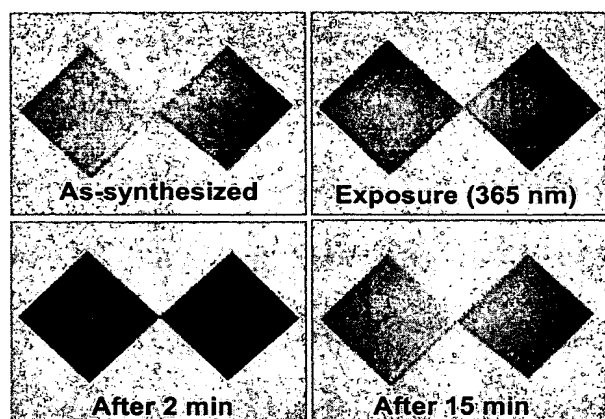


Figure 57. Different dynamic responses of patterned films of 55 wt% $\text{EO}_{106}\text{PO}_{70}\text{EO}_{106}$ -silica composites containing different spiropyran or spiroxazine dye species are shown upon exposure to incident ultraviolet light. Different dye-composite compositions and processing conditions will be explored by using high-throughput synthesis and screening methods, specifically robotic ink-jet printing to deposit systematically varying arrays.